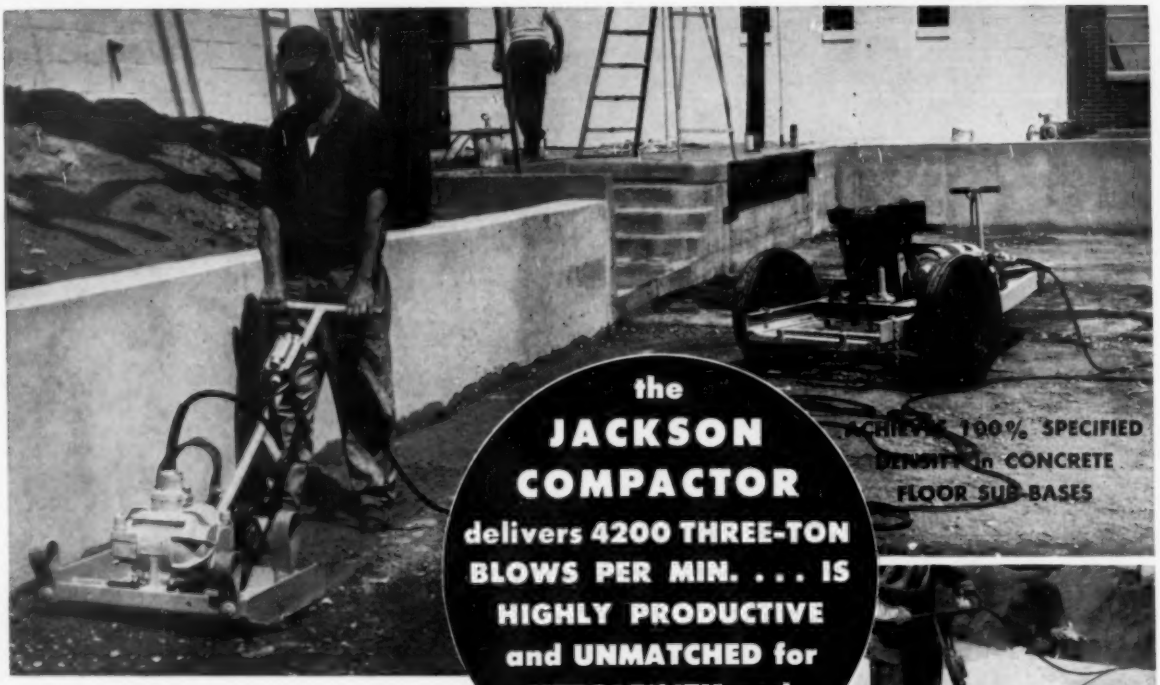
ROADS *and* STREETS

HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTRUCTION

A GILLETTE PUBLICATION

Gillette Publishing Co., 22 West Maple St., Chicago 10, Illinois • Accepted as Controlled Circulation Publication at Milwaukee, Wis.

September, 1959



ACHIEVES 100% SPECIFIED DENSITY in CONCRETE FLOOR SUB-BASES

the JACKSON COMPACTOR delivers 4200 THREE-TON BLOWS PER MIN. . . . IS HIGHLY PRODUCTIVE and UNMATCHED for VERSATILITY and CONVENIENCE!

The JACKSON VIBRATORY COMPACTOR, together with a JACKSON auto-trailer-generator unit equipped to quickly pick up and lower the Compactor, is the handiest, most efficient and versatile outfit imaginable for compacting both granular soils and blacktop in an almost unlimited variety of applications. In granular soils 100% specified density is readily achieved in 6" to 8" layers at the rate of 600 sq. yds. per hour. 5" layers of bituminous mixes are also compacted close to maximum density at the same rate of production. And when a twin hookup is used, such as shown below, one man can easily double this production since the machines are self-propelling and need only be guided by the operator. (THE JACKSON IS THE ONLY COMPACTOR WHICH CAN BE USED IN TWIN HOOKUP.) Quickly interchangeable bases of 12" to 26" widths is another feature that adds to the great versatility of the JACKSON COMPACTOR. For consolidating sub-bases of concrete floors, bridge approaches, compacting in trenches, close to abutments, pavement widening sub-bases, patching and widening bituminous pavement and paving blacktop walks and drives this is the greatest money-making outfit you will discover anywhere. For rent or sale at your Jackson Distributor. His name and literature gladly sent on request. Write, NOW!

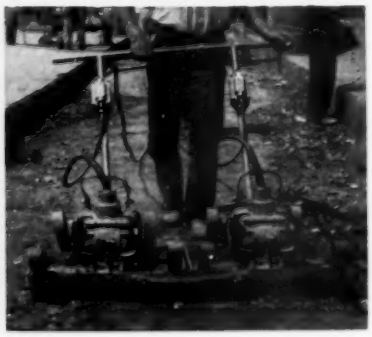
BACKFILL ▲▼ TRENCHES

TWIN UNIT DOUBLES PRODUCTION

JACKSON VIBRATORS INC. LUDINGTON, MICHIGAN

JACKSON MULTIPLE VIBRATORY COMPACTOR

Employs 6 of the above described vibratory compactor units in the normal workhead. Units may be grouped in single or tandem rows to exactly fit each job. This machine offers the fastest means of achieving specified density of all granular materials in macadam base and sub-base courses, fills, etc. Has been used on more of American turnpike projects than all other pan-type compactors combined. Trailer-mounted multiple compactors for towing or pushing by prime movers capable of 50 FPM working speeds available.



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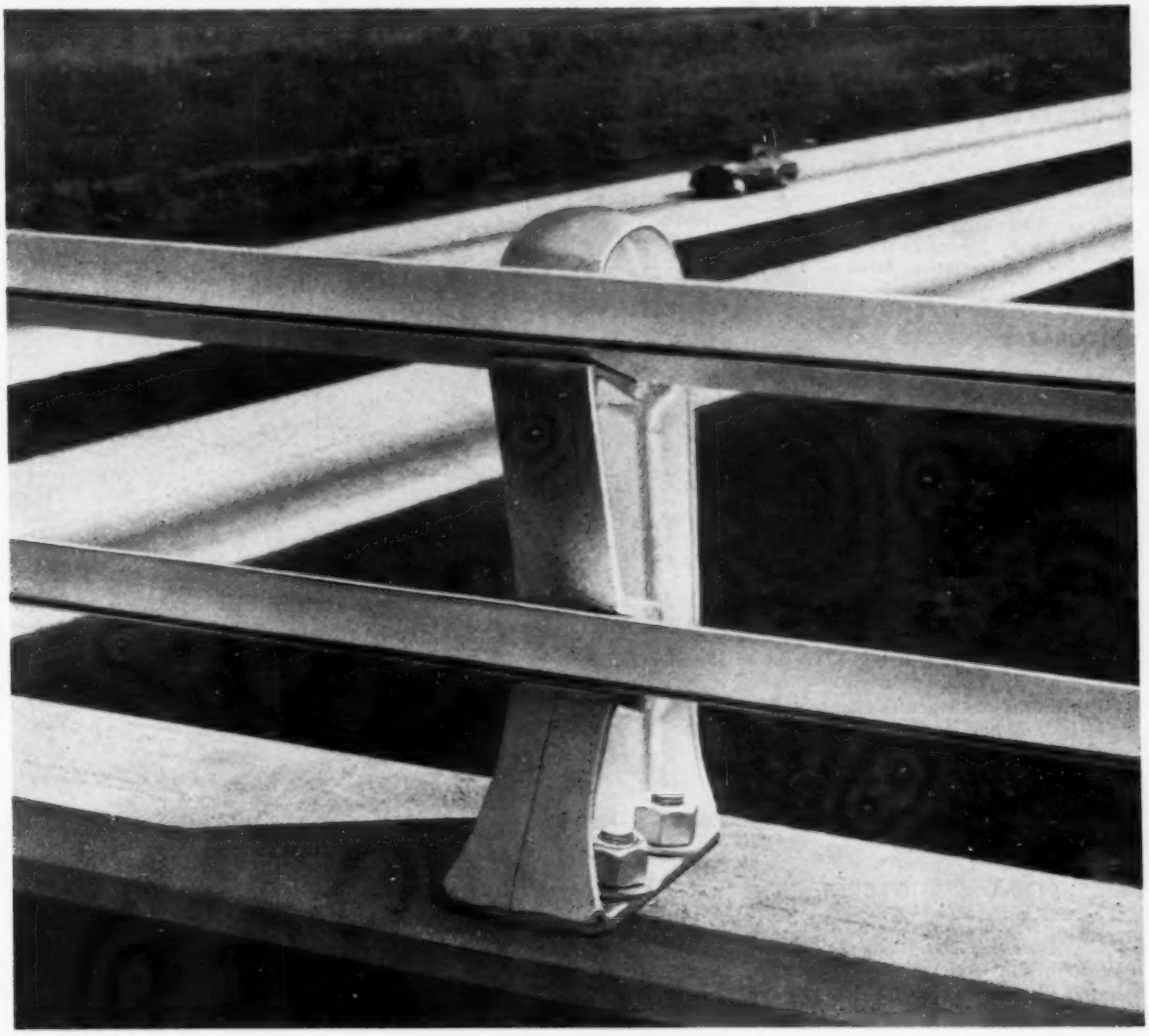

Galvanized for Long Life

BETHLEHEM PERFECT VISION BRIDGE RAILING

When you install Bethlehem Perfect Vision Bridge Rail, you can count on years of service, free from unsightly corrosion. Galvanized to meet all ASTM specifications, Bethlehem Bridge Railing, under normal service conditions, will last as long as the bridge itself.

Send for our free booklet on Perfect Vision Bridge Rail. It gives full specifications and test data. Write to us at the nearest Bethlehem sales office, or direct your request to Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

It's the Railing with Eye Appeal

- Neat, trim appearance . . . unobstructed view.
- Sturdy protection—the rail meets all AASHO strength specifications.
- Easy installation—delivered ready to install, only a few nuts must be tightened.
- Damaged rails easily replaced.
- Variable post spacing.
- Four styles available.

BETHLEHEM STEEL

BETHLEHEM STEEL

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ROADS AND STREETS

A GILLETTE PUBLICATION • SEPTEMBER, 1959 • VOLUME 102 • NUMBER 9

COMING ARTICLES

Highway Award Picture

How has highway contract volume shaped up? What did Congressional indecision do to summer lettings? What of remaining 1959? See special roundup report.

War Against Down-Time

Roads and Streets will take a new look at how the contractors are equipped and organized for lube service, tire management, field repairs and overhauls, parts and supplies. Watch for coming articles.

Contractors Are Gearing Up

Langenfelder's record 5,435 cubic yard day's airport pour at Chantilly . . . How West Texas "Flexible Base King" handles big tonnages . . . With San Ore Construction Co. on out-sized Interstate bituminous stabilized base project . . . Ohio contractor fights clay compaction with $200,000 rolling fleet.

Industry Conventions Ahead

Many meetings and conferences this Autumn. What's in it for both contractors and engineers will be presented in special reports.

Accepted as Controlled Circulation Publication at Milwaukee, Wisconsin. Published monthly. Subscription $6.00 per year ($7.00 foreign).

Goodyear builds a giant to do a giant's job! In this 10-foot, two-ton tire is enough rubber for 320 car tires, enough nylon for 7,200 pairs of stockings. It's the largest tire ever made.

Tire for the Future to Roll on—

The earth-mover for which this tire was designed may still be on the drawing board.

Why, then, has Goodyear invested a quarter-million dollars in equipment to produce this giant off-highway tire?

Simply because, in this age of prodigies, earth-movers of enormous size soon will be taking awesome bites of earth to change the face of ever-building America.

The loads will be staggering, the footing generally bad, the traction uncertain. So Goodyear tire research and engineering men are solving these problems even before builders come to grips with them.

With Goodyear tires like this one, weight distribution will be such that 50-ton loads will bear approximately no more heavily on the earth than would your car.

Fantastic loads will not dig themselves in. Steady traction will move them efficiently regardless of soil conditions. And super-tough treads will fight gouging, chipping and abrasion to keep equipment steadily in service.

You might call this titanic tire a prototype – a research specimen – a proof of unique tire-building ability.

But better call it just the Goodyear way of being ready – well ahead of time – for the future. And the future begins at the next tick of the clock.

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

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ROADS AND STREETS

Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 67 years of continuous publishing in the highway field; combined with Engineering and Contracting and Good Roads Magazines, established in 1892.

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Cat DW21-PR21 units handle rock "on the double" on U. S. 10, Montana

When Albert Lalonde Company, Sydney, Montana, was awarded a $1,537,337 contract on a four-mile section of U. S. 10 on the Interstate System, three Cat DW21 Tractors with Athey PR21 Rear Dump Wagons were purchased for hauling the rock. A. M. Stolzenburg, Superintendent, tells why: "We ran three seasons with them in rock jobs. Now that we're back in rock again, we bought some more. They're big, rugged and an easy shovel target, have a low center of gravity and are maneuverable."

Note how these features met the conditions on this job. The units had to work in limited room on benches and steep haul roads. Material handled for fill included shot rock and sandstone. On haul lengths averaging 300 yards, the units handled 275 cu. yd. an hour. At the start of the job, they worked 8 hours a day; to finish it, 16 hours a day.

New DW21 Series G now 345 HP

Now a new DW21 Series G is matched to the 22.5 cu. yd. PR21 for even faster production on the toughest jobs. Compared with the model it replaced, it has new HP—345 (maximum output) for an increase of 8%. It also has 12% higher rimpull. This increased rimpull provides up to 20% faster travel speeds under similar haul road conditions. Equally important, the horsepower increase was achieved without any sacrifice whatsoever in the excellent torque characteristics of the Cat Super-Turbo Engine.

Get the complete facts on the Cat DW21-PR21 from your Caterpillar Dealer. Ask for a demonstration. Pick a tough job—see for yourself how this giant handles the hard work!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

THE ONLY COMPLETE TRACTOR-TRAILER LINE... BY THE LEADERS

for more details circle 298 on enclosed return postal card

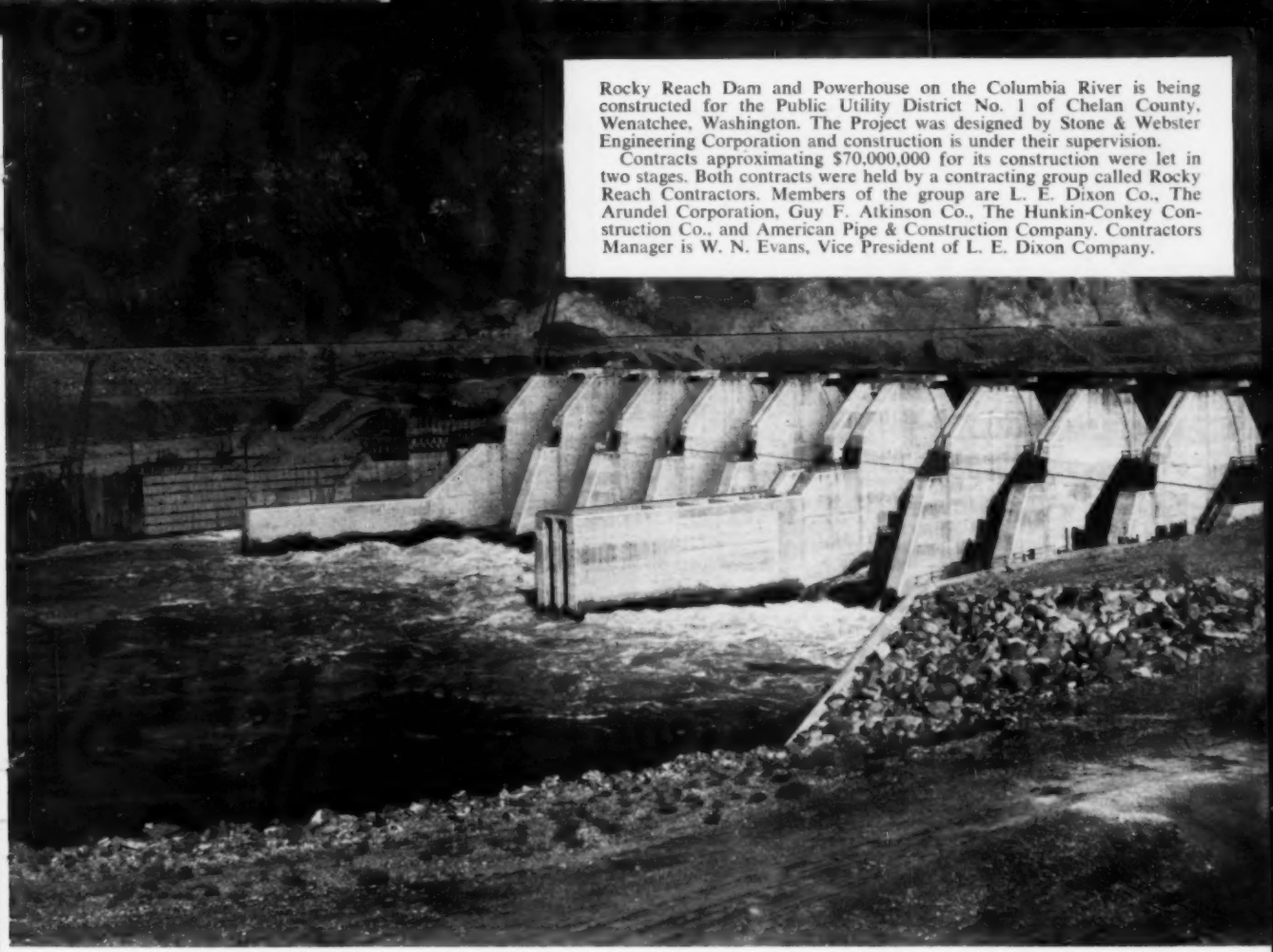
LOAD FAST! PR21 offers a big target. Short non-stop turns of DW21-PR21 unit speed spotting under shovel and work on a narrow bench. PR21's special steel withstands impact, abrasion and corrosion.

ROLL FAST! Two of three DW21-PR21 units on the job. DW21 combines high travel speed with excellent torque characteristics. The PR21 has a 22.5 cu. yd. heaped and 62,000 lb. capacity. All this adds up to fast cycles, top production.

DUMP FAST! PR21 has hydraulic hoists for quick and complete dumping of any material. DW21's hydraulic steering facilitates maneuvering. Wide-section, tubeless tires provide maximum flotation and sure traction.

Texaco Simplified Lubrication Plan Keeps

W. N. EVANS (left), Contractors Manager for Rocky Reach Contractors, points out that the general high production rate on the job can be attributed to extended machine life and decreased downtime. He specified Texaco lubricants after thorough experience with these products in previous major Western dam projects. E. S. Saunders, Texaco Contractor Sales Representative, helped him choose the six basic lubricants required for all equipment on the job.



Rocky Reach Dam and Powerhouse on the Columbia River is being constructed for the Public Utility District No. 1 of Chelan County, Wenatchee, Washington. The Project was designed by Stone & Webster Engineering Corporation and construction is under their supervision.

Contracts approximating $70,000,000 for its construction were let in two stages. Both contracts were held by a contracting group called Rocky Reach Contractors. Members of the group are L. E. Dixon Co., The Arundel Corporation, Guy F. Atkinson Co., The Hunkin-Conkey Construction Co., and American Pipe & Construction Company. Contractors Manager is W. N. Evans, Vice President of L. E. Dixon Company.

Rocky Reach Construction on Schedule

Only six lubricants are needed to handle all major requirements on the Rocky Reach Dam project. That's how the Texaco Simplified Lubrication Plan keeps inventory down, cuts handling and storage costs, helps maintenance personnel sidestep the dangers of misapplication. Here's what Contractors Manager W. N. Evans has to say about it:

"The high production we've been getting from our equipment at Rocky Reach Dam is due in large measure to the help we've had from Texaco. The Texaco Lubrication Plan—and the service that goes with it—really help keep our equipment on the job. We've had little downtime and we're getting longer machine life."

Mr. Evans and the local Texaco Lubrication Engineer chose the six basic Texaco lubricants to meet the requirements of the project after a complete lubrication survey of all equipment. Their selections: 1) *Texaco Ursa Oil Super Duty* for all super-charged engines; 2) *Texaco Ursa Oil Heavy Duty* for all other diesel and gasoline engines and air compressors; 3) *Texaco Rock Drill Lubricant EP;* 4) *Texaco Marfak Multi-Purpose 2* for all grease applications; 5) *Texaco Track Roll Lubricant;* and 6) *Texaco Crater Fluids* for open gears and wire rope.

Your Texaco Lubrication Engineer can show you how much the Texaco Simplified Lubrication Plan has saved other contractors—how it can help you. Call the nearest of the more than 2,300 Texaco Distributing Plants, or write Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

CONSTANT PROGRESS IN OIL'S FIRST CENTURY

TEXACO

Throughout the United States

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LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

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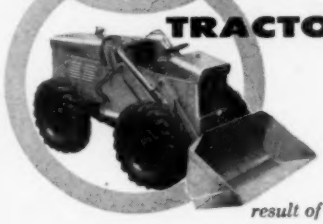
YOU'RE AHEAD

because the specialized experience of two pioneer companies in front-end loaders is now combined . . .

ALLIS-CHALMERS
—pioneer of the world's first successful hydraulically-controlled crawler-mounted tractor shovel.

result of 14 years' leadership



TRACTOMOTIVE
—one of the first to develop heavy-duty rubber-tired loaders.

result of 11 years' leadership

Now Tractomotive Corporation has become part of Allis-Chalmers . . . and that means we'll be able to serve you better than ever. One very important reason is that the specialized experience of each organization in its field cannot be surpassed.

Allis-Chalmers pioneered its history-making HD-5G in 1945 . . . has led the field in crawler shovel design and performance ever since . . . now offers the most complete line of such equipment in the industry, with bucket sizes from 1½ to 7¼ cu yd.

The Tractomotive team has been building heavy-duty wheel loaders since 1948 . . . has consistently pioneered developments of great value to users, including torque converter drive and single-lever shifting control.

Through the combined facilities of these two pioneers, we offer you industry's most complete line of front-end loaders, on rubber or tracks . . . with these added basic advantages to back it up!

- another modern plant joins Allis-Chalmers' extensive facilities for manufacturing construction machinery
- a company-wide record of engineering leadership in all types of heavy-duty equipment
- widespread research activity that insures continuing progress
- original factory parts and blue-chip parts control
- increased man power in sales and service

See 'em at work—your Allis-Chalmers dealer will be glad to demonstrate the machine of your choice—wheel or track-mounted, whichever meets your job needs best. Just give him a call. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wis.

YOU'RE AHEAD **with a TRACTOLOADER** ...a complete line now built and backed by Allis-Chalmers

Seven models—34 to 130 hp—up to 9,000-lb carry capacity. Torque converter drive in every model.

move ahead with ALLIS-CHALMERS

...power for a growing world

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GRADE and COMPACT with...

ONE machine ECONOMY

TWO machine VERSATILITY

GALION 503 Grader with Vibratory Compactor Gives You These ADVANCED FEATURES

- This grader-compactor combination can spread material and compact it on the same pass—or do the operations separately, depending on the situation.
- Leveling of material ahead of the compactor permits the vibrating shoes to make full and firm contact with the material—thus obtaining maximum compaction thru the vibratory action. Specified densities are often accomplished in ONE pass per lift.
- Compacted surface is smooth and flat—no waves or "washboard" effect.
- Electric vibration frequency is 3600 to 4200 vpm.
- This two-units-in-one (grader and compactor) combination saves you money on original equipment cost, labor costs, operating costs, and overhead costs.
- Compactor engine and generator can also be used as an emergency lighting plant, or for the operation of small power tools.

Write for literature.

THE GALION IRON WORKS & MFG. CO.

General and Export Offices Galion, Ohio, U.S.A.

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GALION ESTABLISHED 1907

MOTOR GRADERS & ROLLERS

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CF&I STEEL PRODUCTS

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2. Prestressed Concrete Strand and Wire
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10. Insect Wire Screening
11. Hardware Cloth
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13. Reinforcing Bars and Tie Wire
14. Industrial Screens
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17. Chain Link Fence

Today, wastelands on the perimeters of large cities are being converted into healthy, prosperous suburban communities. Men of vision move in and give these barren regions a complete face-lifting job. The result: new towns and villages that feature such modern conveniences as a "one stop" shopping center.

In the planning stages, engineers specify a host of CF&I steel products to help complete the job safely and efficiently. And throughout the entire construction period, contractors benefit from the dependability of CF&I's many steel products . . . from CF&I's on-the-job engineering assistance . . . from CF&I's network of sales offices and warehouses that furnish them with the *right* steel products at the *right* time.

Always, it is the aim of CF&I to help get the job done better with quality steel products.

FREE! Send for new 32-page catalog, "CF&I Steel Products for the Construction Industry".

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CF&I STEEL

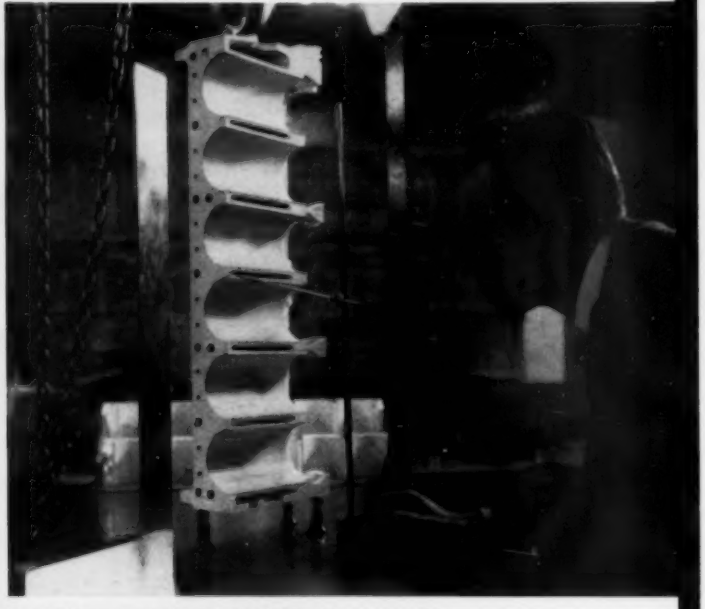
3 reasons why you eliminate

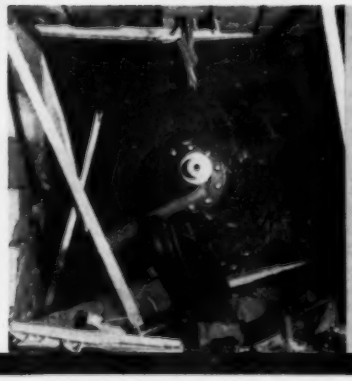
reason **1**

GMC has the most rigid quality-control standards* in the industry. Example—every truck must pass over 1,000 detailed inspections before it gets GMC's OK.

Cab Weld Test – Day-in and day-out, this hammer and chisel are probing spot welds everywhere on the cab, even the unseen, hard-to-get-at spots. Cabs *must* meet GMC perfection before they are released for mounting on the chassis.

Slicer Test – Periodically, standard production engine blocks and cylinder heads are pulled from the assembly line and sliced into 12 to 15 sections. Water jackets and passages, cylinders, supporting members and the like are all accurately checked to make sure they meet rigid blueprint specifications . . . make sure GMC Truck engines are rugged enough to stand up under the most extreme conditions.





Clutch Spin Test—Truck parts in this phase of the GMC quality-control program are subjected to conditions far beyond those experienced by truck owners. This is where we *try* to make parts break by spinning them until they fly into pieces. Then we find out why . . . and correct it.

* Rigid quality-control, creative designing and engineering are the results of Operation "High Gear"—a dynamic GMC program that is paying off with the greatest money-saving, money-making advances in truck history.

standbys with GMC TRUCKS!

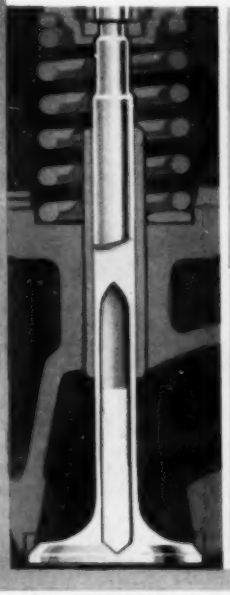
reason 2

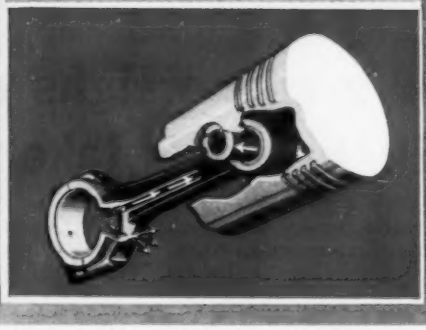
GMC Trucks have extra long life built-in throughout—and it's standard. Take GMC engines for example—

There's additional life and dependability in GMC engines with "free-turn", sodium-cooled exhaust valves. Localized hot spots are prevented. Heat is rapidly transferred away from valve heads.

(Upper). Forged, Tocco-hardened crankshafts in GMC engines have extremely hard, long-lasting bearing surfaces and softer cores for high torsional rigidity.

(Lower). Pistons are weight-controlled to within ⅛ oz. for balanced power. Rifle-drilled connecting rods assure positive piston pin lubrication. M-400 bearings last 7 times longer than others.

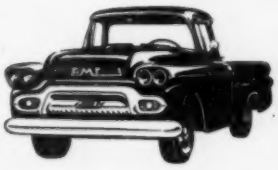




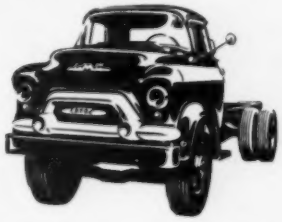
reason 3

Your GMC Dealer's big parts stocks and factory-trained service eliminate costly delays and unnecessary down-time. Another time and money-saving GMC advantage—*one* warranty covers the complete truck, *both* chassis and engine.

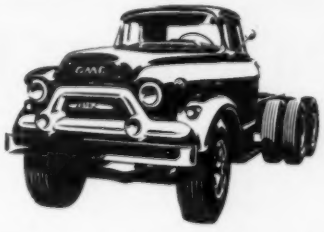
THERE'S A DEPENDABLE GMC TRUCK FOR EVERY CONSTRUCTION HAUL!



GMC pickups are offered in over 30 different capacity, body and wheelbase combinations. Available with 4-wheel drive, Powr-Lok and all power assists.



GMC Dual-Purpose models have 89-inch BBC, best weight distribution and bigger body capacities. GVW to 46,000 lbs., GCW to 60,000 lbs., Six and V-8 power.



GMC builds the biggest selection of six-wheelers, including the lowest-priced model in the 35,000 GVW class. The most complete choice of components makes it easy to have a job-engineered GMC.

GMC
GENERAL MOTORS CORPORATION
TRUCKS

From ½-ton to 45-ton—
General Motors leads the way!

GMC TRUCK & COACH . . . A GENERAL MOTORS DIVISION

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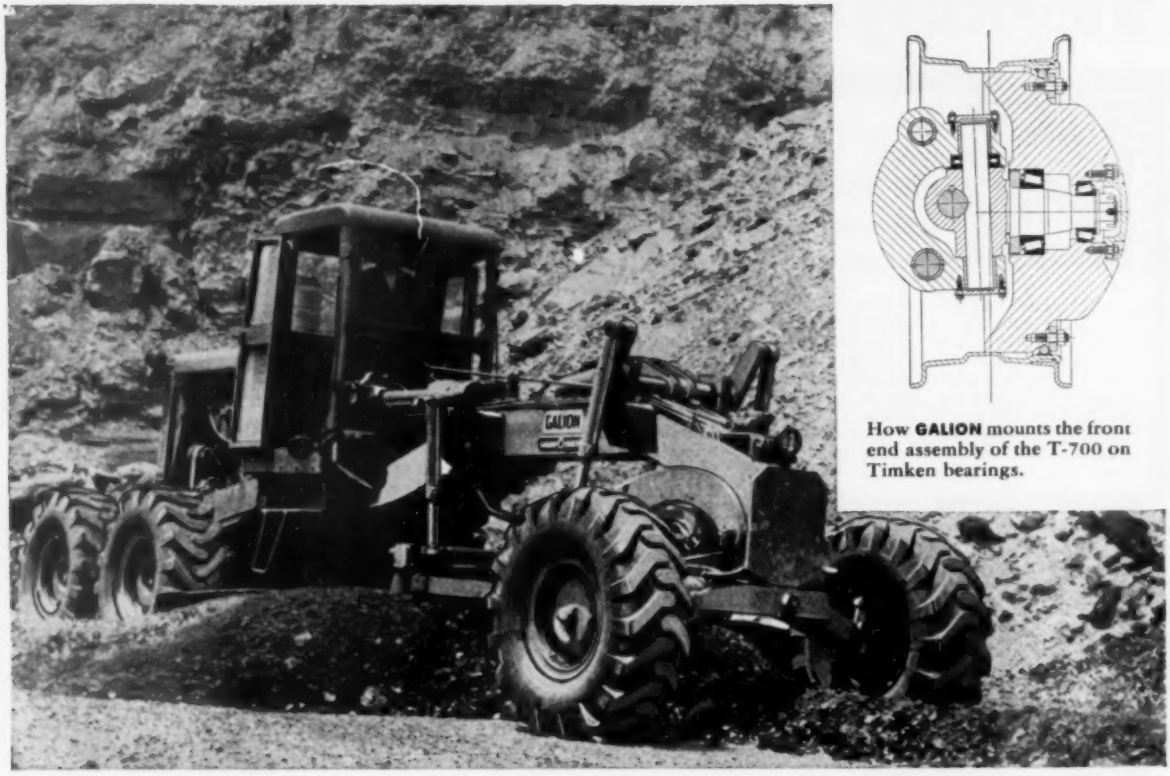

How **GALION** mounts the front end assembly of the T-700 on Timken bearings.

World's largest motor grader weighs more than 20 tons—24 TIMKEN® bearings take the load

THE world's largest motor grader (above) sets up enormous loads as it slams a road into shape. And when it rolls on a steep grade, the thrust loads are even greater. To make sure their T-700 Grade-O-Matic could take *all* the loads, the Galion Iron Works & Manufacturing Company specified 24 Timken® tapered roller bearings—for the reverse gear case, transfer case, front wheels and king pins, and the rear wheel tandem drive.

The tapered construction of tapered roller bearings lets them take all combinations of loads—thrust as well as radial. And because they're case-carburized to produce hard, wear-resistant surfaces over tough, shock-resistant cores, Timken bearings take the shock loads of heavy construction work. And full line contact between rollers and races gives them extra load carrying capacity to stand up to the job day after day, season after season.

Timken bearings are geometrically designed to provide true rolling motion—precision manufactured to live up to their design. They practically eliminate friction. And by holding shafts concentric with their housings, they make closures more effective—keep lubricant in, dirt out.

And to make sure we control the quality of Timken bearings all the way down the line, we even make our own steel—an extra step no other American bearing manufacturer takes.

Make sure you get all these advantages in the machines you buy or build. Specify Timken bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS ROLL THE LOAD

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ROADS AND STREETS
Sixty-Six Years of Editorial Leadership

Washington News Letter

Exclusive - By Duane L. Cronk, Director, Highway Information Services

September, 1959

As this is written, "another in a series" of proposals to keep the National Highway Program on course is being readied for offering to the full House of Representatives. It is difficult to be specific but the general consensus here is that by the time this is read, the Congressmen will have approved a measure to cut back the multi-billion-dollar Interstate apportionment somewhat and to stretch out the construction period for the 41,000 mile network. Prevailing sentiment is that the money needed to rejuvenate the Highway Trust Fund will be raised through a small and temporary federal gasoline tax increase, followed by the dedication of more highway user taxes.

Considering the hassle, many highway observers here feel that anything substantial will be welcome news. Never has highway legislation been so reluctantly written, so timidly offered for consideration. For months, bills to continue Interstate apportionments floundered in the shoals of indifference. When they finally were pushed out into midstream, however, they were caught up in a rapids of political controversy, inter-committee dispute and personality conflicts. Shunted one way and another - by White House opposition or party leaders - it appeared questionable for some time if any constructive measure would reach port.

* * *

There is no point in reviewing the twisting voyage which the highway legislation has taken in the last 30 days. However, there may be some point in noting some of the background conditions which dictated the nature of the Federal-Aid Highway Act and the significance of those influences to those whose livelihood depends upon sensible highway system development in this country. Here are some of the facts of life which came painfully into focus this session:

- The first of these is that the determination of highway legislation is no longer the prerogative of a handful of Congressional committeemen. The huge sums of money involved in the Interstate road program drew the concern of the nearly 700 men and women who make up the House and Senate.

- The second fact of life is that these legislators were inclined to view the multi-billion-dollar program - not on engineering principles - but in the light of party politics, the broader area of national economics, and their own personal fiscal philosophy. To these men, the engineering facts which have been used to "sell" past highway programs are of only partial consideration. The arguments of highway officials testifying before the Congressional committees this session were just as valid as ever, but nowhere near as influential.

- Third, the establishment of the Highway Trust Fund and the linkage of user taxes to new road construction has turned the program into a real people's program. The Congress was very much aware of this. They felt that if renewal of apportion-

(continued on next page)

ments at the current high level required more highway user taxes, that there must be an expression of willingness on the part of users to pay that cost.

All of these factors played a part in the uncertainty surrounding the Interstate program in the House committees. But the biggest reason why this year's federal-aid legislation was caught in the cross-currents of partisan bickering was the outright refusal to consider any specific financing proposal on its own merits. The political leaders on the Hill and in the White House decided early in the session what their positions would be. The result was a pathetic floundering for political advantage. The highway fraternity itself discouraged any serious consideration of one solution or another by declaring that there would be no "scientific" basis for anything until the completion of certain studies in 1961. Add to that the fact that there was a dismaying lack of non-commercial guidance from the "grassroots" level, and there is little wonder that Congressmen had nothing but vague impressions upon which to consider specific schemes.

* * *

The price of construction machinery climbed 30% in the 5-year period from January 1954 to January 1959, a federal agency reported last month. Officials attributed the inflationary cost trend to increased costs of materials and labor. The equipment price curve closely followed the steel price index, for example. (The prices of materials used in manufacture of construction equipment generally rose 30% also during the same period.) Wages in the industry were a little more stable; average hourly earnings advanced 23%.

Greatest price increase during the five years was for hand-held air tools (45%) and the lowest for specialized machinery (23%). Heavy duty tractors rose 34%.

A study into the efficiency and effects of quarry blasting has been launched by the U.S. Bureau of Mines with an eye to determining applicability to highway aggregate production methods. The federal engineers want to evaluate equipment now being used by the industry for measuring blast vibrations, to develop improved techniques and formulas for relating vibrations at a given point to the amount of explosives used, and to establish reliable methods for determining effect on various types of nearby structures.

* * *

Insights into the labor picture . . . Employment in the contract construction industry has fluctuated substantially since 1952. The U.S. Department of Labor reported last month that 256,000 men were engaged in street and highway work for contractors during 1958, a figure that has risen steadily from 209,000 in 1952.

- Contract construction workers have worked longer and longer hours since the 1947-49 base period upon which an index number of 100 is based. In 1956, the index climbed to a high of 135, falling back to 118 in 1958.

- Hourly earnings for highway contractor forces has risen steadily, from $2.21 per hour in 1955 to $2.33 per hour in 1956, to $2.43 in 1957, and to $2.54 in 1958. Average weekly earnings rose from $91.27 to $104.14 during the same period.

The Highway Trust Fund paid out $400 million for construction expenditures in the month of July alone. This is more federal aid than spent in any full year before 1949.

B.F.Goodrich

B.F.Goodrich tires handle the tough jobs at mammoth Niagara Power Project

UNDER construction at Niagara Falls, N.Y., are the powerhouse, waterways, reservoir and intake—all part of the gigantic $720-million Niagara Power Project. Shown above: site of 110′ x 50′ excavation for one of the twin, 46′-wide, covered intake conduits. On the job: a fleet of trucks equipped with B.F.Goodrich tires and owned by Merritt-Chapman & Scott Corporation, largest contractor on the project.

These trucks haul ton after ton of rock and overburden from the excavation to the spoils area, work round-the-clock, 6 days a week, under severe operating conditions. In spite of this, B.F.Goodrich Rock Service tires are still going strong after 3,135 hours of service!

The Rock Service tread is specially-compounded to resist rock cuts and snags. Massive double-chevron cleats give extra traction in forward or reverse. Thanks to the special B.F.Goodrich FLEX-RITE NYLON cord body, Rock Service tires are virtually immune to heat blowouts and flex breaks. Result: you get longer tire life—more retreadable tires!

Other B.F.Goodrich products at work on the Niagara Power Project are conveyor belting, air hose, protective clothing and footwear. Maintenance and service programs for tires and industrial products are also in operation—all part of the new B.F.Goodrich Unified Contractor Program. No matter what your off-the-road job, B.F.Goodrich is ready to serve you—and help you save. Your Smileage dealer is listed under Tires in the Yellow Pages of your phone book. *The B.F.Goodrich Co., Akron 18, Ohio.*

Specify B.F.Goodrich Tubeless or tube-type tires when ordering new equipment

Smileage!

B.F.Goodrich *off-the-road tires*

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It's a bulldozer with exclusive "radius control" of dozing depth which allows you to bulldoze with inch-close accuracy.

It's a scraper with the stripping ability and fast, live "boiling action" of large, expensive carry-type earthmoving scrapers.

It's a Skid-Shovel with patented pry-over-shoe break-out action which gives over 5½ tons of break-out force, for prying out stubborn materials, stumps, and boulders.

It's a clamshell with exclusive ability to "surround" loose materials for loading, and to dump sticky materials through the bottom of the bucket.

New T-340 FOUR-IN-ONE gives you versatility unlimited in ¾ cu yd* size!

Now you can have four-machine utility at the lowest cost ever! New T-340 International Drott Four-In-One combines in one machine the actions of front-end loader, dozer, carry-type scraper, and many-purpose clamshell. With these four machine actions in one, you can handle dozens of specialized jobs single-purpose rigs can't even touch!

The Four-In-One with the new 31 dhp International T-340 crawler makes an unbeatable team for lowest-cost earthmoving and materials handling. The T-340 delivers the most push and pull-power in its size class. Famous Four-In-One Skid-Shovel versatility has never been equaled by any other loader on the market. Together, the T-340 and Four-In-One give you a wider job range and greater earning capacity than ever before available in the small crawler loader field.

Find out first hand . . . see the IH dealer nearest you! For his name, and specification folder, write International Harvester Company, Dept. RS-9, P.O. Box 7333, Chicago 80, Illinois.

⅞ cu yd, heaped.

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

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Meetings

INSTITUTE OF TRAFFIC ENGINEERS—Annual Meeting, Commodore Hotel, New York City, September 13-17.

AMERICAN PUBLIC WORKS CONGRESS AND EQUIPMENT SHOW—Annual Convention, Olympic Hotel and Civic Auditorium, Seattle, Wash.; September 20-23.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA—Annual Meeting of Governing Boards, Kansas City, Mo.; September 21-23.

CANADIAN GOOD ROADS ASSOCIATION, annual conference, Vancouver, British Columbia (Hotel Vancouver) Sept. 22-25.

AMERICAN WELDING SOCIETY—Fall Meeting, Sheraton-Cadillac Hotel, Detroit, Mich.; September 28-October 1.

WIRE REINFORCEMENT INSTITUTE—Annual Meeting, Queen Elizabeth Hotel, Montreal, Quebec; October 1-2.

ANNUAL SHORT COURSE ON ROADSIDE DEVELOPMENT — Columbus, Ohio; October 6-9.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—Annual Convention, Statler Hotel, Boston, Mass.; October 11-15.

AMERICAN SOCIETY FOR TESTING MATERIALS 3rd annual Pacific Area Meeting, Sheraton-Palace Hotel, San Francisco, Calif.; October 11-16.

AMERICAN SOCIETY OF CIVIL ENGINEERS —National Convention, Statler Hotel, Washington, D.C.; October 19-23.

NATIONAL SAFETY CONGRESS AND EXPOSITION—Conrad Hilton, Congress and other Hotels, Chicago, Illinois —October 19-23.

AMERICAN ROAD BUILDERS ASSOCIATION —7th Annual National Highway Conference for County Engineers and Officials, Hotel Leamington, Minneapolis, Minn.; October 26-28.

NATIONAL SLAG ASSOCIATION — Annual Meeting, Boca Raton Hotel and Club, Boca Raton, Fla.; October 29 and 30.

PRESTRESSED CONCRETE INSTITUTE—Annual Convention, Deauville Hotel, Miami Beach, Florida; November 1-7.

ASSOCIATED INDEPENDENT REBUILDERS & PARTS SUPPLIERS—Annual Convention, Hotel Roanoke, Roanoke, Va.; November 2-3.

AMERICAN CONCRETE INSTITUTE—12th Regional Meeting, Continental Hilton Hotel and Hotel Del Prado, Mexico City; November 3-5.

SOUTHEASTERN ASSOCIATION OF STATE HIGHWAY OFFICIALS — Eden Roc Hotel, Miami Beach, Fla.; November 23-25.

THE ASPHALT INSTITUTE—Annual Meeting, Shoreham Hotel, Washington, D.C.; December 2-3.

OHIO CONTRACTORS ASSOCIATION—Annual Meeting, Neil House, Columbus, Ohio; December 7-8.

HIGHWAY RESEARCH BOARD—Annual Meeting, Sheraton-Park Hotel, Washington, D.C.; January 11-15, 1960.

AMERICAN ROAD BUILDERS ASSOCIATION —Annual Convention, Cincinnati, Ohio; January 18-21, 1960.

In Atlanta, it's BMCO for 100% compaction . . . quickly, easily

Federal Aid Project
No. 1 - 401 - 2 (13) Contract #1
Atlanta Downtown Freeway

"This is one of the first jobs in Georgia where 100% compaction is required. The Contractor is having no trouble getting compaction when the moisture is anywhere near optimum."

Ted Smith
Highway Engineer

Specified density on this project was easily met with a BMCO Model HD-114, triple-drum sheepsfoot roller, followed by a BMCO Model SPR-13, self-propelled pneumatic tired roller. An additional pass with the triple-drum roller made the fill bondable for the next layer.

"This proceedure," reports Grading Contractor Harry D. Gregory, "gives us an accelerated compaction rate for required 100% compaction."

It will pay you to investigate BMCO before you invest in any compaction equipment.

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Personals

E. H. SWICK has been appointed regional engineer, Bureau of Public Roads, at Kansas City. For the last two years he has headed the Alaska region for the Bureau. He succeeds W. V. Buck, who retired recently from this position after a long career with the Bureau.

F. R. (RED) OLIVER has been named director of the Arkansas state highway department. He succeeds R. B. Winfrey, acting director since January 15. Mr. Winfrey will re-assume the duties of state maintenance engineer.

F. R. Oliver

Asphalt Institute Staff

Herbert C. Higgins, for thirty years with the Washington state highway department, has joined the Asphalt Institute as district engineer at Olympia. He will represent the states of Washington and Alaska under Pacific Coast managing engineer, B. A. Vallerga of Berkeley, California. His most recent post was engineer of toll facilities in Washington.

Manse Randolph Sharp, Jr., joins the Institute's Dallas office as an assistant engineer, following graduation from Texas A & M College and specialized asphalt experience while in the Corps of Engineers. He will serve under the Institute's southwestern manager, Hugh A. Wallace.

J. R. HARBISON has been appointed director, division of planning, Kentucky state highway department. He succeeds George D. Aaron who has retired.

JOB RECORDS PROVE

Firestones keep tire costs down!

Count on Firestones to reduce your hourly costs—no matter where you work 'em! Every Firestone is job-engineered to match the punishment of the toughest jobs. They're built with Firestone Rubber-X, the longest-wearing rubber ever used in Firestone tires! Exclusive Firestone S/F (Shock-Fortified) nylon or rayon bodies shrug off bruising shock and impact. Specially designed Firestone treads and sidewalls roll through conditions that often ruin ordinary tires. Call your Firestone Dealer or Store and ask about the full line of Firestone tubeless or tubed off-the-highway tires. He'll recommend the tires that are built for your job! And, remember, Firestone off-the-highway tires are backed with on-the-job service!

Rock Grip Excavator Wide Base

Rock Grip Excavator

When ordering new equipment always specify Firestone tires—available tubeless or tubed.

Firestone

BETTER RUBBER FROM START TO FINISH

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PROFIT NEWS FOR POWER USERS IN THE

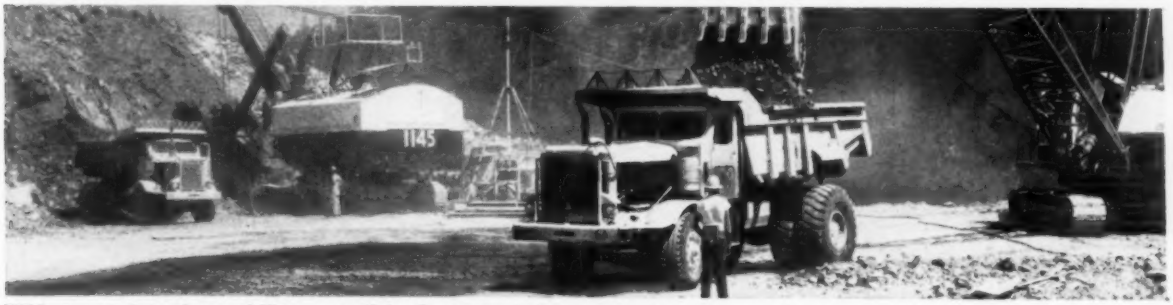
all purpose power line

(20 TO 1650 H.P. IN ONLY 3 CYLINDER SIZES)

Now you can enjoy all the benefits of GM Diesel standardization in every type of equipment and still buy the best makes of equipment on the market

GM Diesel engines are offered in more than 1800 applications of power equipment built by over 250 leading manufacturers—wider availability than any other Diesel.

Only if a power user standardizes on GM Diesel will he get *all* the benefits of engine standardization—for *only* GM Diesel covers the entire power range with only 3 cylinder sizes.



Widest parts interchangeability pays off for fleet users in lower parts inventory requirements—for example, many parts for a 33 H.P. "Jimmy" Diesel fit a 1650 H. P. "Jimmy."

GM DIESEL

PARTS AND SERVICE WORLDWIDE

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

DETROIT DIESEL ENGINE DIVISION, GENERAL MOTORS, DETROIT 28, MICH.

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Personals

M-C&S's Dickensen Dies

Julian A. Dickerson, an assistant vice-president of Meritt-Chapman & Scott Corporation, New York City, died recently at age 65. He was president of Raymond Concrete Pile Co., Ltd, and canadian subsidiary prior to joining M-C&S in 1956. Earlier before the war he had been with the latter firm, and had served in both World War I and II with the Army Engineers, having the rank of Lieutenant Colonal.

LEON V. BELKNAP, engineer-manager of the Oakland County Road Commission in Michigan, died recently at age 71. Belknap was long a leader in the development of roads in the Detroit and Pontiac area and was a prominent figure in county highway engineering circles.

DAN D. JACKSON has been appointed assistant of the Michigan Chapter, Associated General Contractors of America, according to an announcement by George W. Combs, Secretary-Manager of the chapter.

S. M. RUDDER, engineer, division of highway planning, Missouri State highway department, has retired after forty years with the organization. He is succeeded in his job by V. B. Saville, formerly district engineer at Jefferson City.

Concrete Paving Group Formed in Minnesota

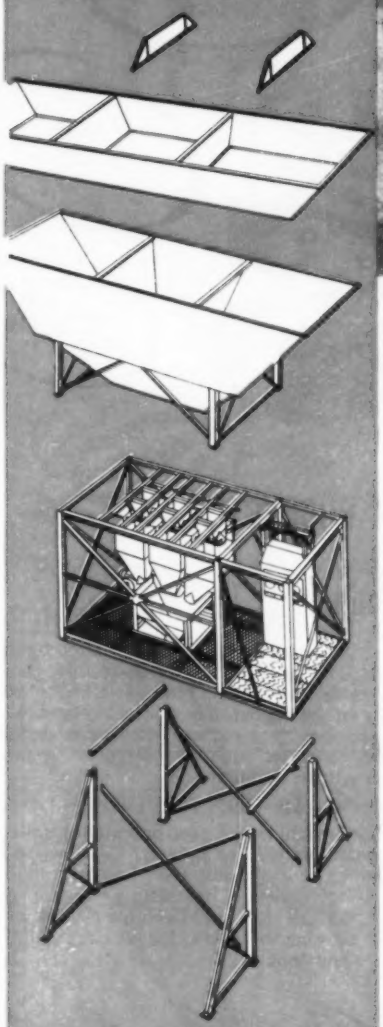
The Concrete Paving Association of Minnesota was recently organized. It's purpose is to encourage the use of Portland cement concrete for highways, streets, airfields and other public construction.

Also, taking a broader view, the leaders of this new group have pledged "to council, advise and render maximum assistance in the conception and planning of roads and other public installations."

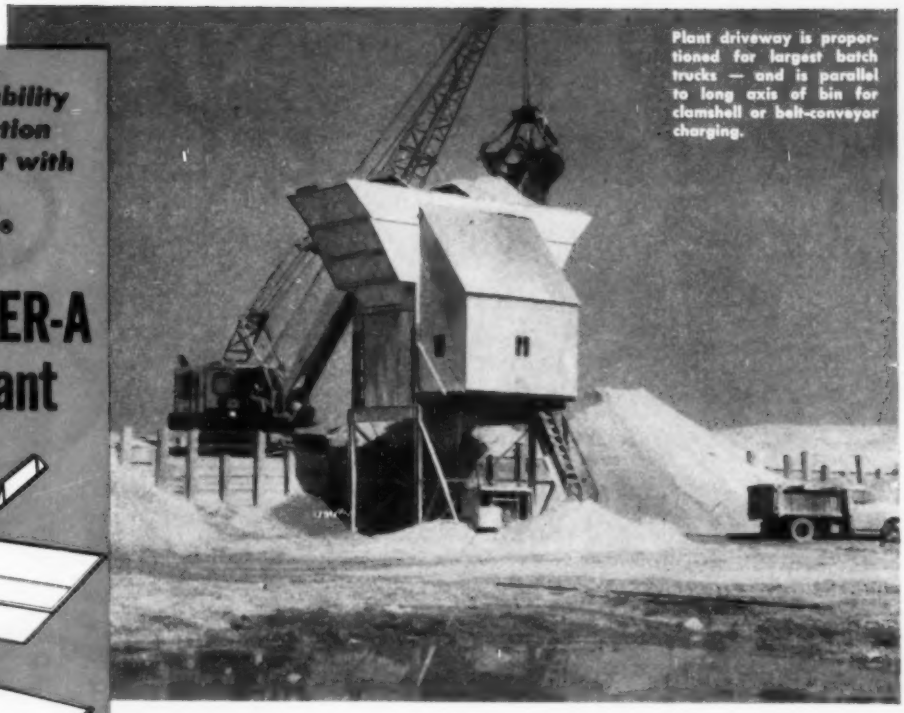
President or the group is Warren B. Woodrich, of Woodrich Construction Company, Hopkins, Minnesota. Albert O. Torgerson, former assistant commissioner of highways in Minnesota, is named executive secretary with headquarters at Detroit Lakes, Minnesota.

Check the portability and high production capacity you get with

Johnson® AUTOMASTER-A paving plant



Quick, easy assembly, disassembly and shipment — a minimum number of units — batching and recording equipment remain intact during job-to-job moves — plant erection time, approx. 16 hours — maximum lift is only about 9 tons.



Plant driveway is proportioned for largest batch trucks — and is parallel to long axis of bin for clamshell or belt-conveyor charging.

120 cubic-yard bin handles 3 or 4 aggregates

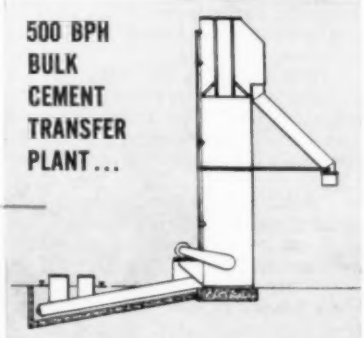
New Johnson AUTOMASTER-A brings paving contractors all the latest advantages for high capacity, automatic aggregate batching. Teamed with the companion AUTOMASTER-C dual-batcher cement plant, it makes today's most efficient, easily-erected 2-stop plant — meets the most rigid weighing and recording specifications.

Aggregate bin is available with 3 or 4 compartments. Total heaped capacity is 120 cu. yds. (180 tons @ 3,000 lbs. per cu. yd.). 38 cu. ft. batchers — one for each aggregate — have 3,000-lb. scales, with moisture compensators. The full-reading, springless dial scales are mounted in pressurized cabinet containing heated, filtered air, for extreme accuracy. Gates are air-ram operated with electric control, manual override. 12 preset mix selections are available at the turn of one dial!

Plant handles standard 1½-cu. yd. paver batch. Depending on number of compartments in batch trucks, it produces up to 240 batches of aggregates per hour. (For extreme high production, the Johnson AUTOMASTER-A is available with *2 sets* of either 3 or 4 aggregate batchers per set.)

All plant controls are mounted in the pressurized cabinet, along with interlocks, indicator lights, emergency controls. Johnson graphic pen-recorder, with time, date and batch-sequence stamp, also mounts in the scale cabinet. Better check this new Johnson AUTOMASTER series for any 1, 2 or 3-stop operation. Call distributor *today*.

500 BPH BULK CEMENT TRANSFER PLANT...



Here's another time-saver for paving contractors. Low-cost Johnson bulk cement transfer plant unloads railway hopper cars, loads trucks at approx. 500 bbls. per hour with adjustable screw at 10° incline — (600 BPH with screw level). Gasoline or elec. power.

J900

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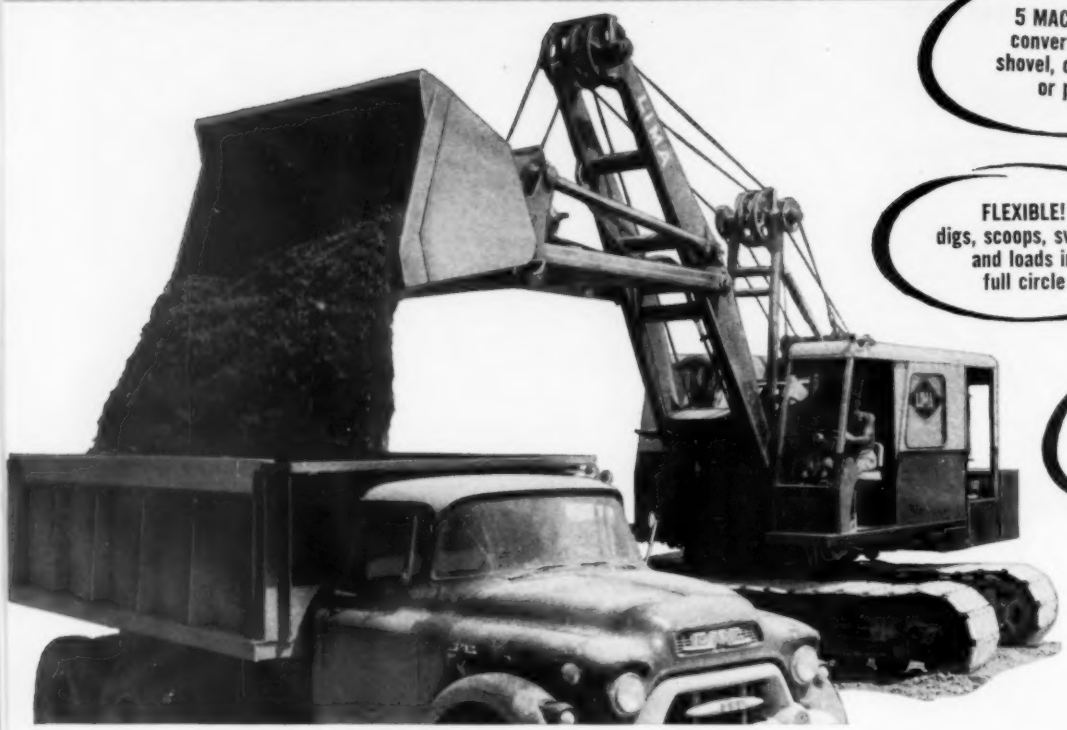
CUT YOUR LOADING COSTS WITH NEW 5 Yd. LIMA LOADER



5 MACHINES IN 1! converts in field to shovel, crane, dragline or pullshovel

FLEXIBLE! digs, scoops, swings and loads in full circle

ELIMINATES WASTE MOTION

CUTS WIDE 8-Ft. SWATH

NEW LIMA UNIT GIVES TOP LOADER PRODUCTION WITH SHOVEL EFFICIENCY... serves as excavator, materials handler

The new Lima Loader, with giant 5-yd. bucket, moves more dirt and materials faster and more profitably.

These are the reasons — long horizontal crowding action; big 5-yd. capacity bucket; full swing versatility; high-speed digging and loading from stationary position.

NO WASTE MOTION

Powerful 9-ft., 10-in. horizontal crowding action assures maximum loading at every 5-yd. bite . . . even when handling wet materials. Bucket is completely filled without moving machine; results in less travel wear, lower maintenance and fuel consumption.

For maximum versatility, the Lima Loader is mounted on basic Lima 64 crawler type machine. It operates at top efficiency, hour after hour, from a stationary position, no time-wasting maneuvering with each load. Unexcelled full-swing digging and loading at any point of the compass means high production . . . higher profits!

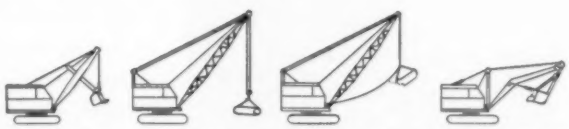
Actually the Lima Loader is 5 machines in 1. It can be speedily converted in the field to a 1¼ or 1½-yd. *shovel*, 40 or 50-ton *crane*, 1¼ or 1½-yd. *pullshovel*, or variable capacity *dragline*.

Other important operational features of the Type 64 Lima Loader include hydraulically controlled bucket which raises to 25-ft., 6-in., permitting 16-ft., 10-in. clear dumping height at 18-ft. radius. The bucket tilts to 52 degrees for complete emptying. 8-ft. wide bucket, with removable teeth, cuts accurately and evenly on sloping banks as well as level ground. Independent travel, optional equipment, but recommended with loader. Torque converter matches power to digging resistance; eliminates engine stalling.

PRECISION AIR-CONTROLLED

The main and auxiliary machinery is precision air-controlled for amazingly easy operation without fatigue.

See your nearest Lima distributor today or write Baldwin-Lima-Hamilton Corporation, Construction Equipment Division, Lima, Ohio, for full information on the 5-yd. Lima Loader — the newest addition to Lima's famous line of high-quality construction equipment.



Shovels to 6-yd. Cranes to 110-tons Draglines, variable Pullshovels to 2½-yd.

LIMA Construction Equipment Division, Lima, Ohio

BALDWIN · LIMA · HAMILTON 5956

Shovels • Cranes • Draglines • Pullshovels • Roadpackers • Crushing, Screening and Washing Equipment

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Bearings...

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The longer your engines run before need of overhaul - the less your cost of operation. Sinclair Tenol® Motor Oils have earned the reputation not only for giving long bearing life, but also for resisting the formation of harmful carbon deposits. Tenol Oils slash down-time and maintenance costs. Next time management asks how you've cut costs, tell them you've switched to Sinclair Tenol—and show them the results.

Call your **Sinclair Representative** for further information or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. There's no obligation.

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Sinclair Tenol® Motor Oils

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Papers on Welding Invited by AWS

The American Welding Society invites authors to submit papers on welding or related subjects for presentation at its 41st Annual Meeting and Welding Exposition at Los Angeles, April 25-29, 1960.

All applications abstracts and manuscripts are screened by the Society's Technical Papers Committee. Each abstract should be sufficiently descriptive to enable the Committee to evaluate the proposed paper. Abstracts should contain not less than 500—but preferably not more than 1000—words. Whenever possible, abstracts should be accompanied by the complete manuscript.

Papers are invited on a broad variety of subjects related to contractors' machinery, bridge design and construction and other related subjects. These subjects include: pressure vessels and storage tanks; equipment and pipe lines used in petroleum industry; design and fabrication of all types of weldments, including machinery; structures; automation as applied to welding processes; resistance spot, seam and projection welding; gas-shielded arc welding; new processes; welding of castings and composite structures; welding of "new" alloys; weldability of high-strength steels; welding of aluminum, magnesium, zirconium, titanium, molybdenum and like metals; brazing; maintenance; surfacing; soft soldering; and practical applications or "how-to-do" topics are deemed to be of particular interest at the Los Angeles Meeting.

Abstracts must reach AWS not later than August 15, 1959, to ensure consideration for the Los Angeles program. Copies of the author's application forms may be obtained from the American Welding Society, Dept. P, 33 West 39th St., New York 18, N.Y.

Experiment With Coal in Road Building

Governor David L. Lawrence of Pennsylvania, has approved a legislative bill to authorize the use of road building material made from coal for experimental paving. The measure directs the state department of highways to make tests with the coal base material. The department is authorized to pay the cost of constructing the experimental strips. The bill noted that developing new uses for coal would aid the economy of depressed areas of the state.

ANOTHER RUSH JOB... another EUCLID job!

S. J. Groves using 67 "Eucs" at Bong Air Force Base

At Kansasville, Wisconsin, the new Bong Air Force Base is being rushed to completion for the Strategic Air Command. Earthmoving and paving work on this 5,440 acre base was awarded to S. J. Groves and Sons Company and is under the supervision of the Chicago District Corps of Engineers. Nearly 14 million cu. yds. of excavation will be moved prior to the contract completion date.

In spite of the tight schedule, grading is well ahead of the timetable. With 2-shift operation, efficient job management and a large fleet of modern earthmoving equipment, Groves moved 8½ million cu. yds. in 4 months. A total of 67 Euclid units... more than 3 times the number of other big rubber-tired haulers on the job... are making the dirt fly! A long-time Euclid owner, Groves acquired six Model TS-24 "Twin" Scrapers to supplement their Euclid fleet at Bong. These big scrapers, with 2 engines and all-wheel drive, can work without the assistance of pusher tractors... have already played an important part in keeping the earthmoving well ahead of contract schedule.

On big rush jobs like this one, or on smaller projects, too, modern Euclid equipment maintains high production at low cost. Have the dealer in your area give you the facts and figures that prove ***Euclids are your best investment.***

EUCLID **Division of General Motors, Cleveland 17, Ohio**

Groves is using 32 Bottom-Dump Euclids at Bong . . . 10 have struck capacities of 13 cu. yds. and the others are 17 yd. units. Pavement-smooth haul roads enable the Bottom-Dumps to take full advantage of their fast travel speeds for high production.

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

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New Publications

HUMAN SENSITIVITY TO VIBRATION, by E. T. Wright and R. Green. Report No. 7, Queen's University, Kingston, Ontario. A report of an investigation by the university's civil engineering department in cooperation with the Ontario department of highways, on vibration levels which cause apprehension to motorists on large bridges.

Manual on Calcium Chloride in Concrete

Concrete users will be interested in the revised third edition of the 64-page Manual CM-1 "Calcium Chloride in Concrete" offered by the Calcium Chloride Institute. It is a ready reference to quantitative data and includes nearly 20 charts and 40 illustrations which refer to the various benefits of calcium chloride as it is used in modern concrete construction.

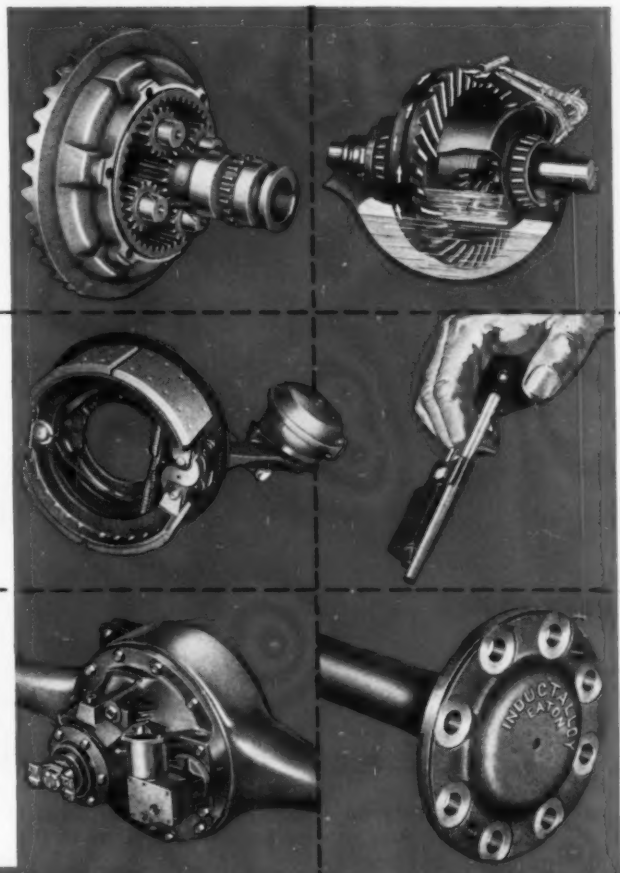
Copies of Manual CM-1 may be obtained on request to Calcium Chloride Institute, 909 Ring Building, Washintgon 6, D. C.

ACCIDENT FACTS, 1959 EDITION. National Safety Council's 96-page statistical yearbook. Contains data on all types of accidents, including traffic and industrial, valuable for making speeches, writing articles, preparing reports and planning safety campaigns. For single copy or quantity prices, write National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

CONTINUOUS STEEL REINFORCEMENT FOR EXPERIMENTAL CONCRETE PAVEMENTS. Bulletin 214, Highway Research Board, 2101 Constitution Ave., Washington, D. C. Price $2.40. This 113-page bulletin contains six papers comprising a Symposium on Continuous Reinforcing in Rigid Pavements presented at the Board's 37th annual meeting.

LANDSLIDE OCCURRENCE AND ANALYSIS. Bulletin 216. Highway Research Board, 2101 Constitution Ave., Washington, D. C. Price $0.80. This 43-page bulletin includes three papers presented at the 37th annual meeting of the Highway Research Board.

Only Eaton 2-Speed Axles Have these Cost-Saving Features



PLANETARY GEARING

—distributes wear over four rugged, slow-moving planetary gears, resulting in lower unit stress, reduced maintenance, and longer axle life.

FORCED-FLOW LUBRICATION

—supplies positive lubrication to all moving axle parts, even at slowest vehicle speeds. Reduces wear; cuts repair bills.

SELF-CONTAINED AIR BRAKE

—makes quicker, safer stops. Simple design with fewer parts cuts relining time. Available on Eaton air brake models.

POWER SHIFT CONTROL

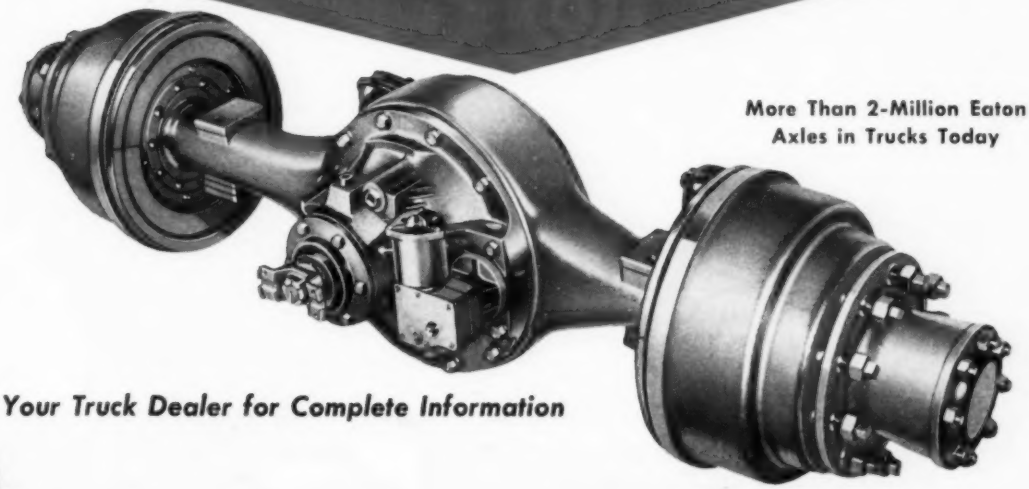
—provides quick, easy shifts. Drivers use right ratio for road and load; take full advantage of 2-Speed benefits.

EXTRA-RUGGED CONSTRUCTION

—of housing and all moving parts eliminates the possibility of harmful distortion or misalignment under full load; holds maintenance to a minimum.

INDUCTALLOY AXLE SHAFTS

—made of alloy steel, with Eaton's exclusive method of dual-hardening truck shafts; last up to 10-times longer; keep trucks on the road.



More Than 2-Million Eaton Axles in Trucks Today

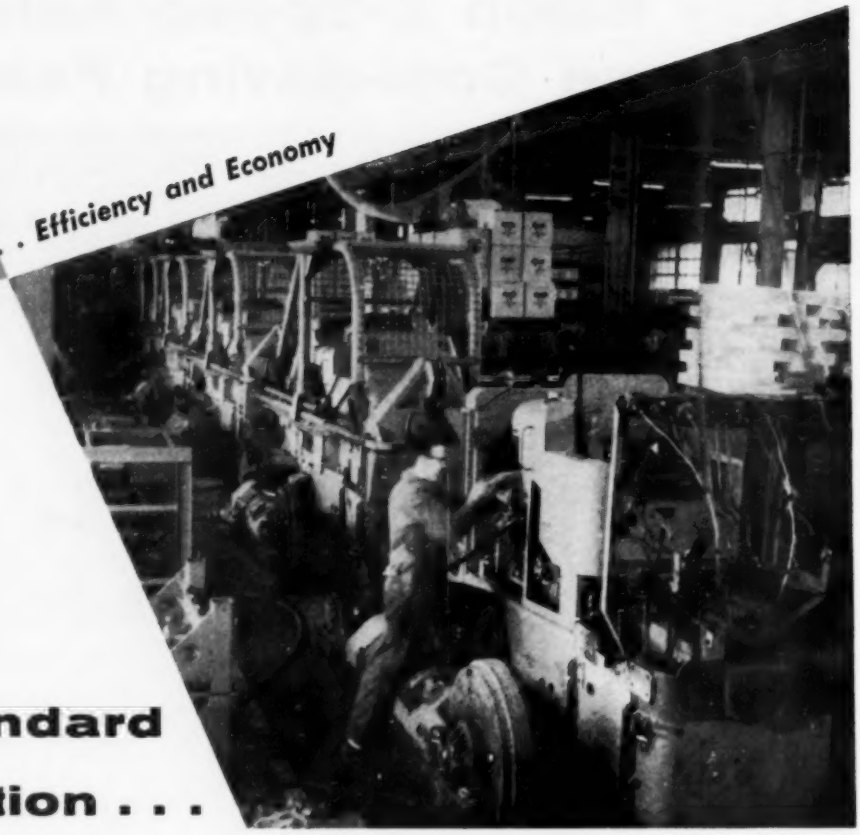
Ask Your Truck Dealer for Complete Information

EATON

AXLE DIVISION
MANUFACTURING COMPANY
CLEVELAND, OHIO

. . . for more details circle 313 on enclosed return postal card

THE BIG E . . . Efficiency and Economy



Not standard production . . .

. . . but produced to a standard*

There are still those in the tractor industry that state that the modern Eimco line of tractors and tractor-units just aren't assembly line, mass-produced machines. While, as a matter of fact, our assembly lines, one of which is shown above, are kept very well filled, and additional ones are being built to keep up with the ever-increasing demand for the modern Eimcos, there is some basis of fact in their statement.

Eimcos are **not** built by standard production methods. While mass production standards **are** high, they just aren't high enough for the quality engineering and craftsmanship that goes into every crawler unit bearing the Eimco name. Therefore, Eimco developed a production and assembly technique that is unique, in that it permits production of "custom-built" machines, without assembly interruptions. Everyone of dozens of machines going down the line may have some variation in engineering, engine, tracks, attachments or other components . . . variations, required by the end-use of the unit, that will result in immense savings in greater work-output, lesser maintenance, for the ultimate buyer of that specific unit.

Sure, it costs more to build a tractor that way . . . but **you** pay no more for a quality-built Eimco. For the folks at Eimco feel that the construction, mining, timber, steel and hundreds of other industries served by thousands of Eimco tractor units all over the world, deserve to get what they expect when they specify an Eimco. More efficiency. Greater economy. Increased work-ability. The advanced engineering and quality craftsmanship for which Eimco has been famous for nearly seventy-five years, and many more extras that you get at no extra cost, with an Eimco.

Why don't you let a qualified Eimco sales-engineer explain and demonstrate the many advantages of the modern, job-proven Eimco line of tractors to you. Just contact the sales office nearest you or write The Eimco Corporation, P. O. Box 300, Salt Lake City 10, Utah, U. S.A.

**** The highest in the industry!***

"ADVANCED ENGINEERING AND QUALITY CRAFTSMANSHIP SINCE 1884"

THE EIMCO CORPORATION

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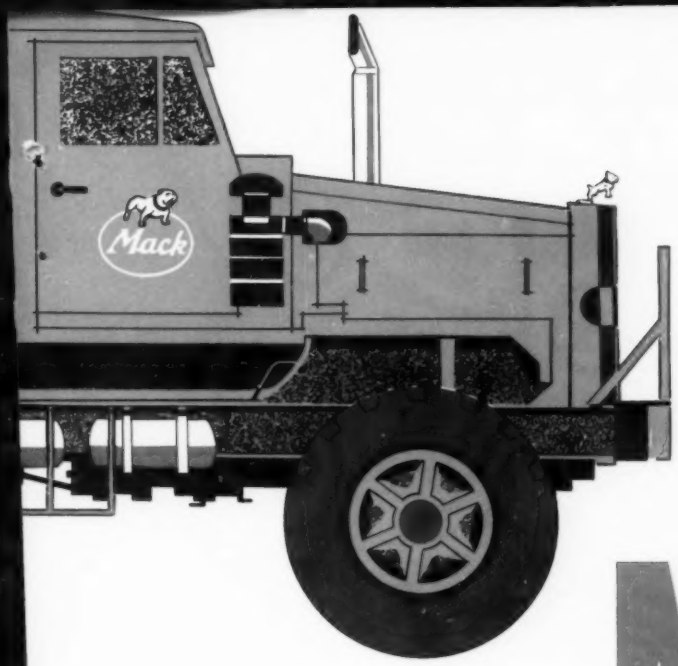
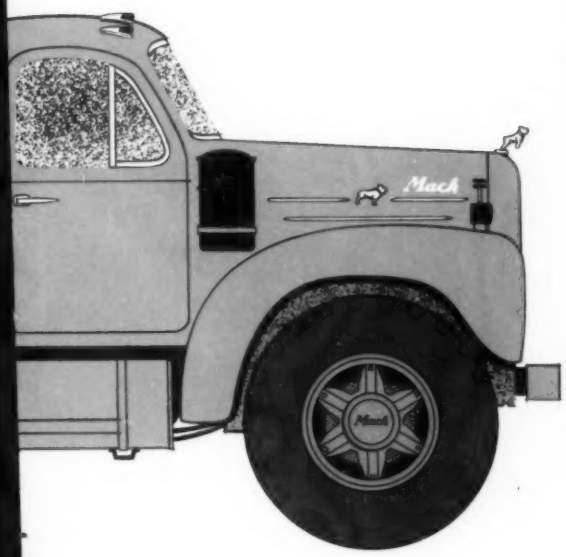


MACK BALANCED DESIGN



gives you more for each truck dollar

Mack Balanced Design is achieved by engineering and building components which work together with maximum efficiency. Only Mack can offer Balanced Design because only Mack makes all its own major components... makes them to standards of ruggedness and precision accomplished nowhere else. Mack Balanced Design results in a truck whose engine, clutch, transmission, axles and suspensions all work in harmony to produce an uncommonly smooth, powerful, responsive unit.

There's a MACK for

Mack B-40 Series—5 to 10 yards as rear dumpers, 5½ to 7 as mixers

They combine big-truck power, capacity and stamina with small-truck agility and economy for service as dumpers, tractors, mixers and platform trucks. 150 hp Mack Magnadyne gasoline engine. Wide choice of Mack transmissions up to 20-speed units, in on-highway and off-highway versions (depending on model). Choice of heavy-duty axles and frames that offer standard and optional reinforcement. Option of power steering. Six-wheelers offer Mack Balanced Bogie with Power Divider. All-wheel-drive units as well.

every construction job

Mack B-60 Series—6 to 12 yards as rear dumpers, 5½ to 8 as mixers

These trucks have hung up records for economy and long mileage life on every kind of job—as dumpers, mixers, tractors and platform trucks. The "workhorse of the industry", they're powered with Mack Thermodyne® gasoline or diesel engines from 170 to 205 hp. Wide choice of Mack transmissions up to 20-speed units, in both on-highway and off-highway versions (depending on model). Choice of heavy-duty axles as well as frames that offer standard and optional reinforcement. Option of power steering. Six-wheelers feature exclusive Mack Balanced Bogie with Power Divider.

There's a MACK for

Mack B-80 Series—7 to 14 yards as rear dumpers, 7½ to 10 as mixers

Here's Mack profit-power personified! Big, rugged B-80's can be custom-assembled to meet your needs exactly: as tractors for heavy-duty hauling of platform or dump trailers...or as truck chassis for dumper, mixer or utility service. Wide option of power and gear ratios. Available in 4- and 6-wheel models including six-wheel-drive units. Powerful, durable braking power.

Up to 232 hp Mack gasoline or 205 hp Mack Thermodyne diesel engines; up to 320 hp stock diesels. Choice of Mack transmissions including Mack 20-speed Quadruplex. Mack Dual Reduction rear axles and—on 6 wheelers—Mack Balanced Bogie with Power Divider. Mack front-wheel drive axle on six-wheel-drive models. Option of power steering.

every construction job

Mack "L" Series—15-25 ton end-dumpers to 50-ton bottom dumper

The Macks in the "L" Series—LRX 15-ton, LR18X 18-ton, LVX 22½-ton, LV25X 25-ton and the giant LRVX tractor which pulls 50-ton bottom dumper—are designed with the power and strength to handle the biggest construction jobs. They shrug off the relentless pounding of big-yardage shovels, and are loaded with features for top performance, long life and freedom from downtime.

Rugged power trains offer up to 450 hp diesel engines... Mack overgeared transmissions or torque converters and Mack Planidrive rear axles... powerful air brakes of latest design handle steepest descents... maneuverability characteristics of smaller vehicles – thanks to ideal power steering and air-assisted clutch.

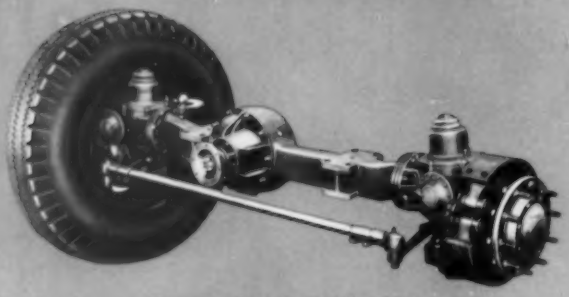
For end-dumper capacities up to 40 tons, where maximum flotation is required, a full line of tandem rear axle Macks is available.

MACK BALANCED DESIGN

MACK
for over 6 straight years
NO. 1
by far in sales of diesel trucks

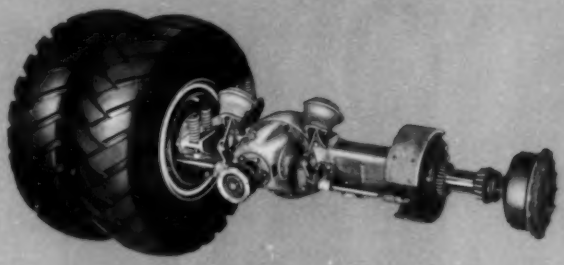
means components integrated for longest prime of life.

Only Mack offers these exclusive quality components:



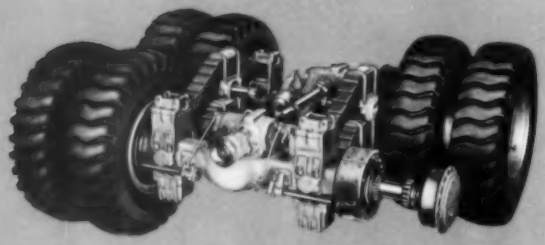
Strong Mack-built axles

Mack's drop-forged I-beam front axles are made super strong for long, trouble-free service. Extensive use of heat-treated steels for crucial parts means minimum maintenance. And Mack's exclusive **front-drive axle** (shown above) for all-wheel-drive trucks offers the greatest ground clearance and strength of any made—with all parts fully enclosed.



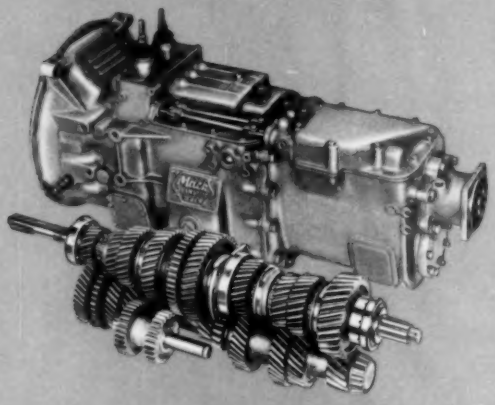
Durable Mack-built 2-wheel rear axles

Mack's two-wheel, rear-axle assemblies have an unmatched reputation for service under strenuous conditions. Dual Reduction carrier and Mack's famous Planidrive gear reduction at the wheel hubs provide the smooth distribution of power vital to top truck performance.



High-traction Mack-built Balanced Bogies

Macks perform where other trucks bog down—in mud, loose gravel or sand—thanks to Mack's exclusive Balanced Bogie with Power Divider—a 4-wheel drive, tandem rear-axle assembly with an inter-axle differential that distributes the power to wheels with greater traction. To achieve maximum road clearance in larger units, Mack Planidrive final reduction gears in all 4 hubs eliminate the need for outsized carriers and low-slung differentials.



Long-lived Mack-built transmissions

Service records prove that Mack transmissions—like this 20-speed Quadruplex—stand up to heavy-duty hauling far longer and need less attention than any others—thanks to the use of the finest gear metals known...to painstaking precision manufacture...and to exclusive Tetrapoid gear design that gives maximum strength, longer life and smoother action. Five- to twenty-speed units, each with ideal ratio steps.

MACK FIRST NAME FOR TRUCKS

Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd., Toronto, Ontario

7934

A 9' power-sliding moldboard picks up and carries loads smoother and faster.

H-W Maintainer Offers Real Job Versatility

Whatever the job requirement . . . you can count on the versatile Huber-Warco M-52 Maintainer to turn in top performance.

The H-W Maintainer is a 45½ h.p. unit . . . weighs 6,250 lbs. . . . and features a torque converter. Working speeds range from 1.7 to 8 m.p.h., and a travel speed of 21 m.p.h. permits quick movement from job to job. The Maintainer is an all-purpose, year 'round performer, capable of outperforming many machines that are larger, heavier, more costly, slower, more expensive to operate and more limited in use.

With hydraulically cab-controlled attachments, the Huber-Warco Maintainer will perform service as a lift-loader, bulldozer, broom, snow plow, scarifier, side dozer, berm leveler and patch roller. This versatility makes it an ideal machine for all types of construction and maintenance assignments.

Your Huber-Warco distributor will be happy to give you complete details about the M-52 Maintainer . . . in fact, he will even give you a demonstration of the outstanding performance of the Maintainer. Your Huber-Warco distributor can arrange terms up to 36 months for you on the purchase of a new machine, or provide you with a rental unit. See him soon.

Huber-Warco on the job

M-52 Maintainer . . .
a top performer on all construction and maintenance jobs.

Hydraulic attachments permit the H-W Maintainer to perform service as a bulldozer, scarifier, berm leveler and lift-loader.

Huber-Warco Company

MARION, OHIO

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HUBER W WARCO


TANDEM ROLLERS


MOTOR GRADERS


MAINTAINER


3-WHEEL ROLLERS

New Publications

AGC Offers New Procedure Publications

The Associated General Contractors of America has made available three new publications expected to be of value to architects, engineers, contractors, and construction contract awarding authorities. They include :

• *Recommended Guide to Bidding Procedure on Engineering Contion,* an up-to-date reference and procedural document for use in competitive bidding on engineering construction projects.

• *Suggested Guide to Bidding Procedure on Building Construction,* which basically establishes the recommended practices for use in competitive lump sum bidding for private work. It is also applicable on public work where requirements permit.

• *Insurance and Bond Check List,* which includes the type of insurance and bonds which are commonly used by general contractors.

Also announced by AGC:

• *Recommended Guide to Bidding Procedure on Engineering Construction* was developed by The American Society of Civil Engineers-AGC Joint Cooperative Committee for use in connection with engineering construction. It promotes the contract method of construction and most federal agencies already have established bidding procedures in close agreement with those set forth in this guide.

The guide should have application in engineering construction for private, state, county, and municipal awarding agencies that do not have procedures in line with today's contracting practices.

• *Insurance and Bond Check List,* developed for general contractors and provides them with a record for each project, as well as providing a check to be sure they have adequate coverage. The insurance section is a revised version of an earlier AGC publication, and the new bond part was developed recently in cooperation with the Surety Association of America.

Individual copies of the above documents may be secured without charge from the AGC at 20th and E Streets, N.W., Washington 6, D. C. Quantity prices on request.

SOIL AND MATERIALS SURVEYS BY USE OF AERIAL PHOTOGRAPHS. Bulletin 213, Highway Research Board, 2101 Constitution Ave., Washington, D. C. Price $1.20.

This 52-page bulletin, jointly sponsored by the Committee on Surveying, Mapping and Classification of Soils and the Committee on Photogrammetry and Aerial Surveys, contains four papers presented at the 37th annual meeting of the Board. These discussions should be particularly helpful to both design and soils personnel concerned with highway and street location and procurement.

FROST EFFECTS IN SOILS AND ON PAVEMENT SURFACES. Bulletin 218. Highway Research Board, 2101 Constitution Ave., Washington, D.C. Price $1.00. A 48-page bulletin containing four papers presented at the 37th annual meeting of the Board.

Protect against accidents like this!

Use straight Morton Rock Salt—the most effective way to help keep streets, freeways and tollroads safer in winter

Straight Morton Rock Salt does the job abrasives and Salt mixed with abrasives can't do to help prevent accidents caused by ice and snow. Morton Rock Salt gives *abrasive traction* against skidding even before the salt starts to melt the ice. Rock Salt crystals are larger than other commonly used ice melting chemicals and *penetrate ice deeper* with a corkscrew action—not just melt surface ice. Due to Rock Salt's better penetration, it reaches the pavement fast and quickly *melts* the bond between ice and the street surface.

Morton Rock Salt is safe, clean, economical

Straight Morton Rock Salt is non-toxic. It does not damage animals' paws, rubber, fabrics, leather, asphalt, brick or properly seasoned concrete. It will not clog sewers or leave a rutted, dirty pavement as will sand or cinders. What's more, Rock Salt melts *more ice at lower cost* at any temperature above 8° F. than any other commonly used ice melting chemical.

Send for more information today!

☐ Please send me your free book on ice and snow removal.

☐ I would like a Morton representative to advise me on how best to stockpile Morton Rock Salt.

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Title_____

Address_____

City_____ Zone____ State_____

MORTON SALT COMPANY

INDUSTRIAL DIVISION

Dept. RS-9, 110 No. Wacker Drive, Chicago 6, Illinois

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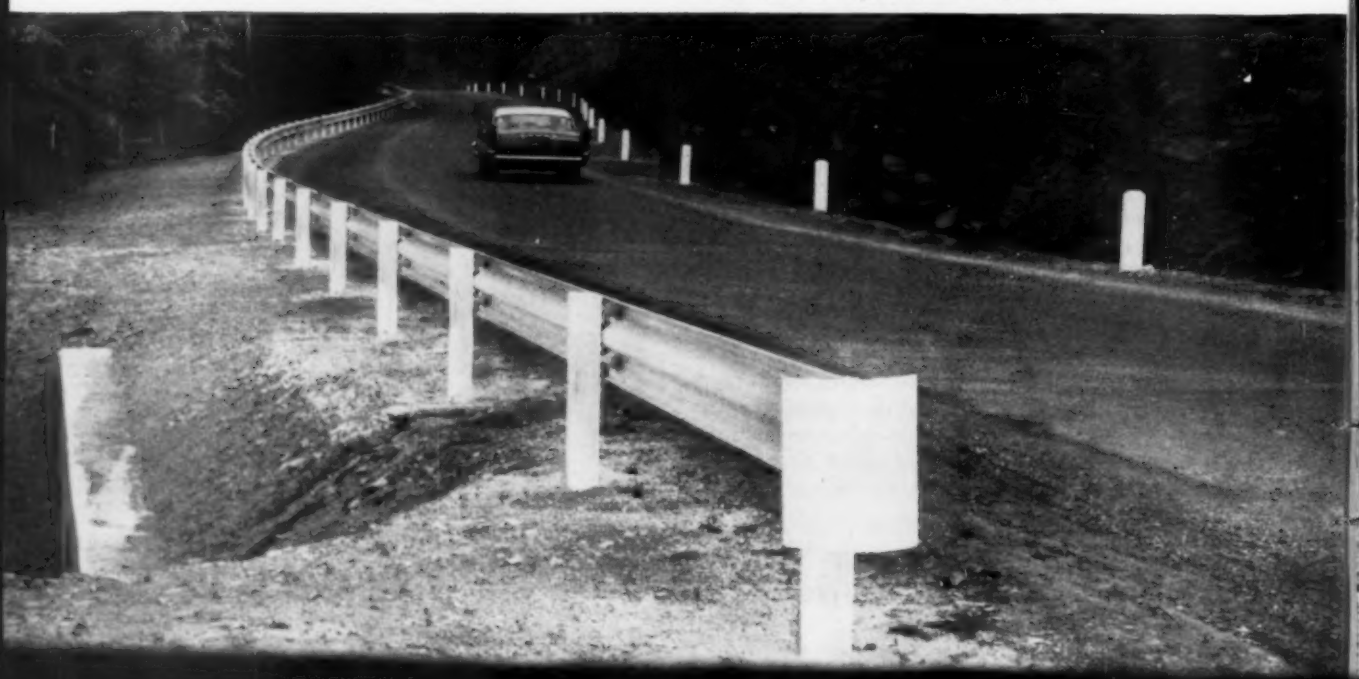
KEEP OUR ROADS ON THE GO

Let American Bridge help do

USS AmBridge Highway Beam Guardrail and Posts provide the surest traffic safeguard available. The rugged, flexible and highly visible steel beam guardrail is easily and firmly bolted to quickly driven steel posts. Available in 25' lengths to minimize splicing.



USS AmBridge Sectional Plate pipe, pipe-arches and arches eliminate the need for forms. And, being made of steel, there is no breakage. They are placed quickly, and can be extended whenever the road or fill is widened. They are extremely durable, and they can be relocated if necessary. AmBridge Sectional Plate comes in a complete range of standard sizes.

There's nothing easy about building a road, especially where there is an obstacle to span—or drainage to accommodate. Fortunately, however, you can throw these tough jobs to an outfit that specializes in handling them: American Bridge.

Wherever man or nature has created a space barrier, American Bridge can build a bridge of any length to span it—or we can re-floor an old bridge to support more weight . . . without stopping traffic. If the problem is a meandering creek, it can be funneled through an American Bridge drainage structure, which can be placed in days and will last for years. On the finished road itself, American Bridge can supply the strongest, simplest, *safest* guardrail on the market.

All AmBridge highway products are made from steel, and are manufactured to long-established, dependable standards. They can be placed quickly and simply—without kid-glove handling. Contact any office for information, or write to Pittsburgh for literature on sectional plate, bridge flooring or guardrail literature. *USS and I-Beam-Lok are registered trademarks*

American Bridge
Division of
United States Steel

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Boston • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit
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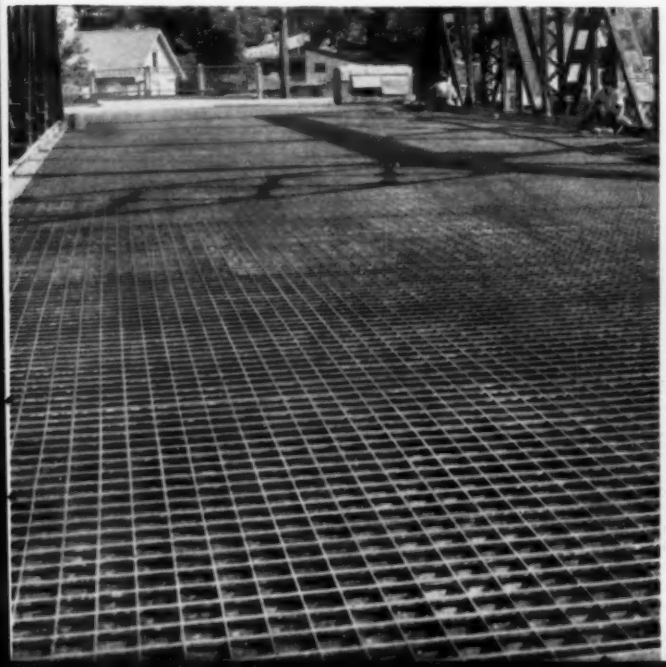
Portland, Oregon • Roanoke • St. Louis • San Francisco • Trenton
United States Steel Export Company, New York

the toughest part of your roadwork

USS AmBridge I-Beam-Lok—the sturdy, lightweight, long-life bridge flooring for modern traffic—saves money on erection and maintenance. Ease and speed of installation minimizes traffic interruptions. Filled-type shown below, before pouring concrete, is available in units 6′ wide and up to 49′ long. They can be applied directly to stringers on spans from 6′ up to 8′ centers. Open type also available for spans up to 4′ long.



Steel is basic for bridges. And nobody knows more about building steel bridges than American Bridge; specialists in steel fabrication and construction since 1900. In nearly sixty years, we have handled every conceivable type of job. From big ones like the mighty Mackinac Bridge, and the new Carquinez span (the first major shop-welded bridge) to thousands of simpler and shorter structures.

New Publications

Skid-Proofing with Slag

SKID-PROOFING CITY STREETS, COUNTY AND STATE HIGHWAYS, USING BLAST FURNACE SLAG. By H. W. Bauman, Bulletin 241, American Road Builders' Association, World Center Bldg., Washington 6, D. C.

This 24-page bulletin, available upon request from the ARBA, contains a factual review of data available on the subject and constitutes a technical reference in connection with the planning of skid-resistant surfaces.

"Preparing For Future Highway Use"

This the title of a booklet available free on request to the Automotive Safety Foundation, 200 Ring Building, Washington 6, D. C.

Number 5 in a series of ASF reports, this pamphlet reviews the need for government leaders, legislative members, and others in public service for looking ahead in preparing for traffic growth.

This valuable pamphlet outlines the importance of the problem and the need for action to be taken by governmental people so that engineering programs can flow in an orderly fashion. This analysis, covering activities to meet long-range needs in the field of motor vehicle ownership and use, was prepared by Louis R. Morony, Director, Laws Division, and John M. Magill, Laws Division staff of the Foundation.

BITUMINOUS PATCHING MIXTURES AND SEAL COATS. Bulletin 215. Highway Research Board, 2101 Constitution Ave., Washington, D. C. Price $0.80.

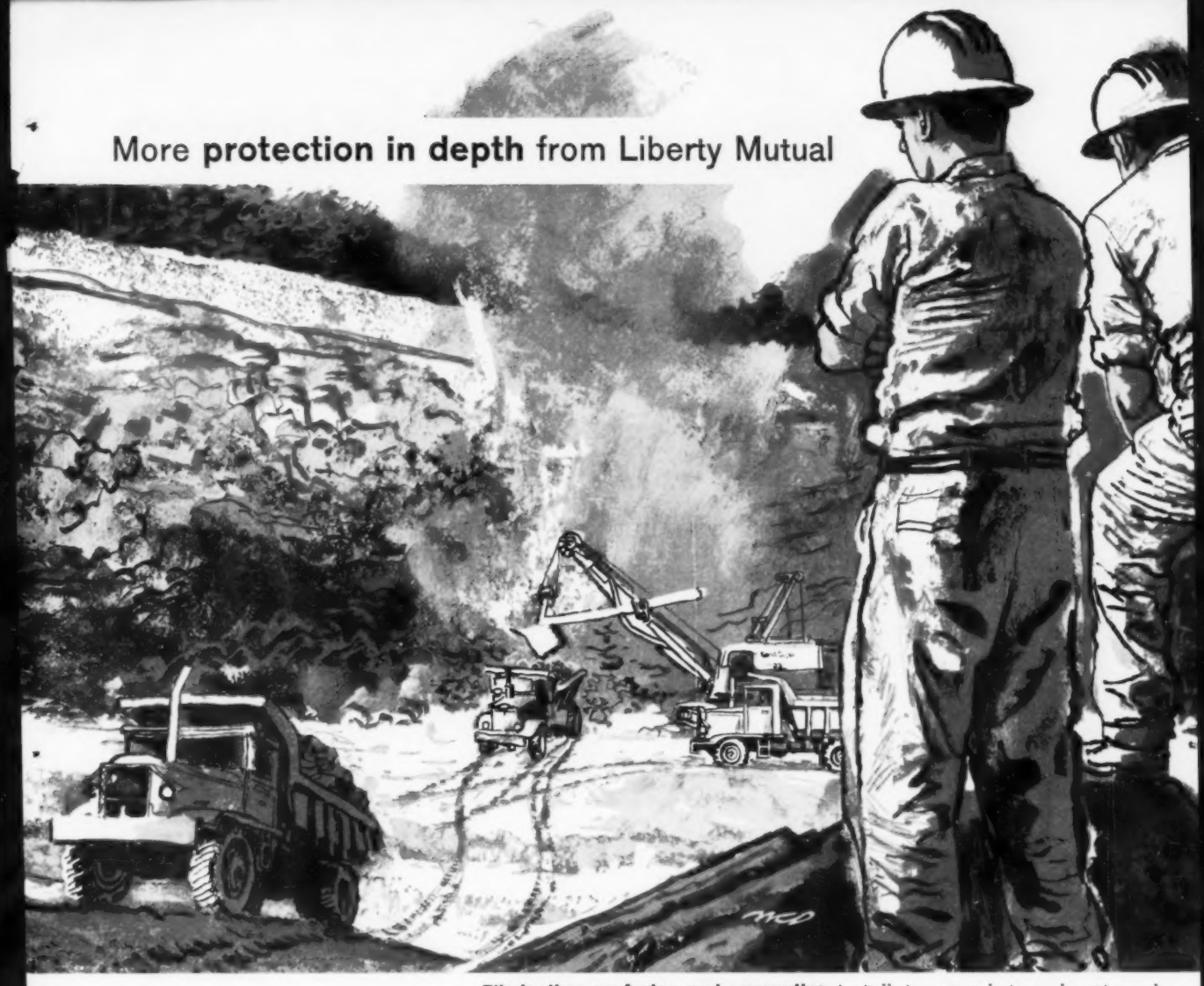
A 37-page bulletin containing two papers sponsored by two committees of the Bituminous Division, Department of Material and Construction, of the Board, and presented at the 37th annual meeting.

The first, entitled "Cutback Asphalt Patching Mixtures," by J. R. Bissett, presents some of the results of a research project at the University of Arkansas sponsored jointly by the Arkansas state highway department and the Bureau of Public Roads.

The second, entitled ,"Seal Coats:

(Continued on page 50)

More **protection in depth** from Liberty Mutual



Eliminating confusion and congestion is vitally important during rock cutting and removal. Liberty Mutual safety engineers will study your site, help you spot hazards and set up a safe traffic pattern. This service is all a part of protection in depth.

How to keep order down on the floor and cut your compensation costs

A deep cut has long meant danger. When your shovels, dozers and dump trucks must operate in close quarters, extra hazards are created. Injuries, work stoppage and higher insurance costs are often the result.

Today, Liberty Mutual's wealth of knowledge and experience in road-building safety is called on by contractors coast to coast. Construction safety engineers are ready to show you dozens of ways to reduce on-the-job hazards.

This extra service in safeguarding your road gangs is a function of Liberty's protection in depth. From the start of your Liberty coverage, protection in depth helps you avoid accidents and losses, lessens their impact if they happen. This means lower insurance rates, giving you a competitive edge on your job bids.

Protection in depth has helped thousands of Liberty policyholders cut insurance costs through experience modification. To learn how it can help *you*, write or phone your nearest Liberty Mutual office. There are 146 of them located all across the country.

Look for more from

LIBERTY MUTUAL

...the company that stands by you

LIBERTY MUTUAL INSURANCE COMPANY • LIBERTY MUTUAL FIRE INSURANCE COMPANY • HOME OFFICE: BOSTON
Business Insurance: Workmen's Compensation, Liability, Group Accident and Health, Fire, Fleet and Crime
Personal Insurance: Automobile, Fire, In[illegible] Marine, Burglary, Homeowners

New Publications

(Continued from page 48)

Better Performance," by Ernest Zube, describes studies relating to improvement of seal coats, including development of tests, apparatus, materials and application procedures.

TRAFFIC ACCIDENT STUDIES—1958. Bulletin 208. Highway Research Board, 2101 Constitution, Washington, D. C. Price $1.60.

This 83-page bulletin contains six papers on various phases of traffic accident studies as presented at the Board's 37th annual meeting:

"Traffic Accidents and the Quality of Traffic Flow," by Bruce D. Greenshields; "Economic Costs of Motor Vehicle Accidents," by Robie Dunman; "Statistical Evaluation of Traffic Accident Severity," by Edmund J. Cantilli; "An Analysis of One-Car Accidents," by Richard W. Bletzacker and Thomas G. Brittenham; "Predicting Traffic Accidents from Roadway Elements on Urban Extensions of State Highways," by J. A. Head; and "Sampling Procedures for Determining Speed Characteristics at Rural Locations: A Progress Report," by Joseph W. Guyton and A. K. Stonecipher.

CONCRETE PAVEMENT DESIGN RESEARCH, 1959. Bulletin 217. Highway Research Board, 2101 Constitution Ave., Washington, D. C. Price $1.00. This 49-page bulletin contains two papers presented at the 37th annual meeting of the Board: (1) "Fifteen-Year Report on Experimental Concrete Pavement Project in Oregon," by G. S. Paxson, and (2) "Performance of Doweled Joints Under Repetitive Loading," by Leslie W. Teller and Harry D. Cashell.

SEVENTEENTH SHORT COURSE ON ROADSIDE DEVELOPMENT. The Department of Landscape Architecture, The Ohio State University; and the Ohio Department of Highways.

The publication of these reports in a single volume serve as an important source of information on subjects pertaining to the development of the 'the complete highway'. Topics covered include: new trends in planting design; roadside rests; the desirability of aesthetic values in highway design.

GIVES YOU EXTRA DUMP ***HEIGHT*** *WITH A BONUS IN* ***REACH*** *. . . LOADS BIGGEST TRUCKS EASILY*

- **72 net engine hp**
- **21,000 lb**
- **1½ cu yd general purpose bucket**

With as much as a foot more dumping height than the maximum for ordinary tractor shovels, the 6G reaches 'way out at any height to dump over the center of big, side-boarded, 12-yd trucks . . . places each bucketful just where you want it. This height-and-reach combination pays off other ways, too—building stockpiles or loading out over the sides of excavations.

AND THAT'S ONLY THE BEGINNING . . .

NEW SLANT IN TRACTOR SHOVELS

NEW BENEFITS for YOU

- 40° bucket tip-back
- Fast reverse to 4.1 mph
- Important operator advantages
- New "down-slope" visibility
- Best reach, best dump height in its class

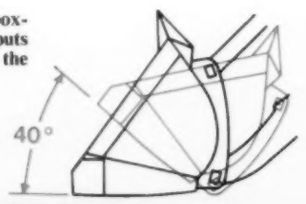
HERE'S EVERYTHING YOU NEED FOR

BIG PRODUCTION

BREAKOUT

action of the new 6G puts a 10¼-ton force at the cutting edge as the heavy-duty bucket tips back 40° on its curved bottom. This tremendous pry-out is far more effective than the fixed leverage of an ordinary, shoe-type bucket bottom. The 6G easily digs, lifts and loads stubborn boulders, stumps, pavement slabs or any hard-packed material with effortless speed—gets *more* digging-loading work done *faster* than any tractor shovel near this size.

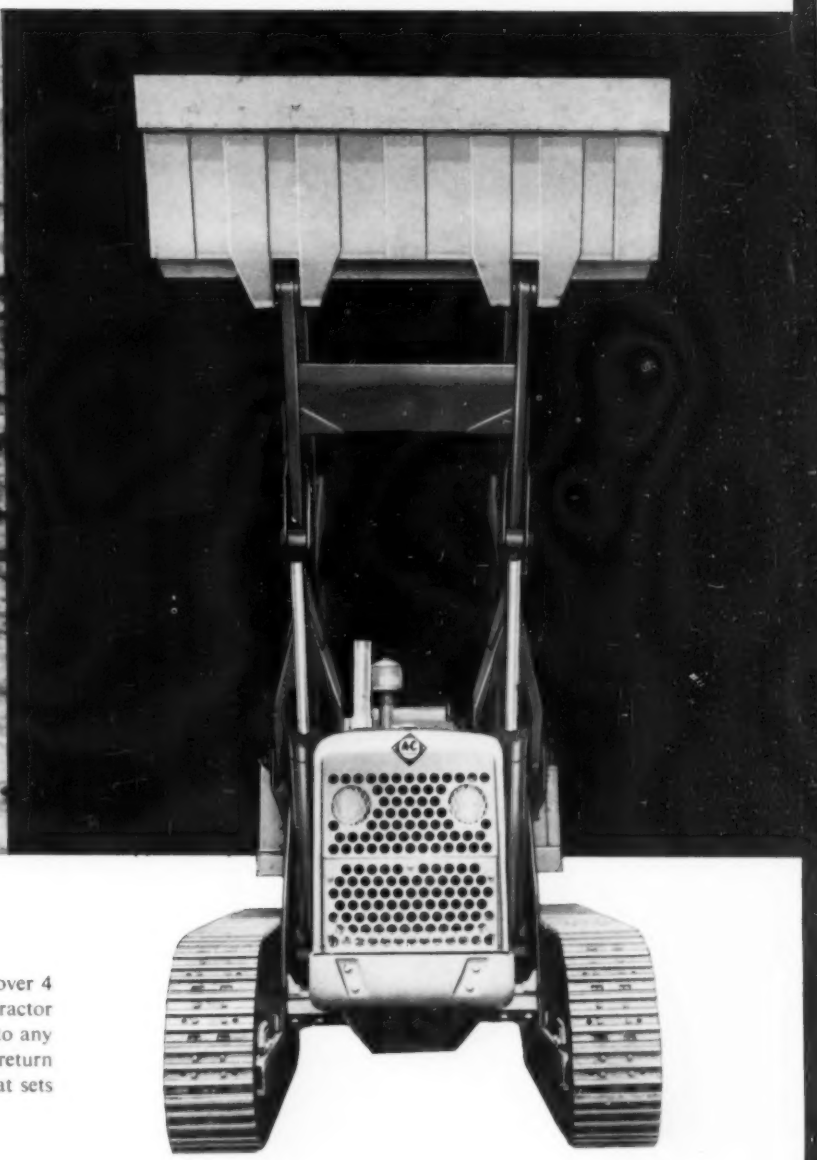
40° tip-back on curved, box-section bottom of bucket puts 21,500-lb breakout force at the cutting edge.



BALANCE

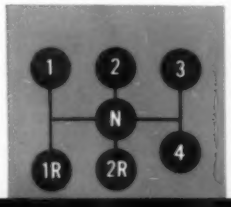
of the new 6G is outstanding, with nearly seven feet of track on the ground to distribute tractor and load weight for safe handling at big-production speeds. Engineered and built from track to stack as a tractor shovel—not just a tractor with a bucket—the 6G has stability and strength to lift heaviest loads safely and surely, right to the top without wobble or wasteful spilling. Dependable, heavy-duty hydraulics provide the precise control necessary to hold finish grades.

...AT LOW COST



SPEED

. . . the new 6G can back away with a load at over 4 mph! You choose the *right speed* for every tractor shovel function—shift briskly from high reverse to any forward speed with a single lever. Bucket lift and return is perfectly controlled—a smooth, swift cycle that sets a fast pace on any job.



STRENGTH

. . . "In-Line" booms and linkage are twin towers of solid-steel strength in the new 6G. They're straddle-mounted on wide-spaced pivots in the shovel side frames for no-sway stability in all positions. Lift and dump cylinders operate in exactly the same line, put the 6G's hydraulic power to work "straight from the shoulder."

ALLIS-CHALMERS HD 6G

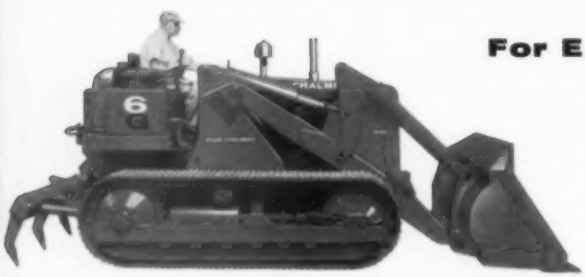
New Operating ease and service simplicity mean extra production . . . long life

Roomy Comfort. Deck-level entrance gangway . . . nine-position, foam-padded seat . . . easy-to-reach controls . . . plenty of leg room.

Clean-Sweep Visibility. Down-sloping, tapered cowl and hood . . . clear view of bucket . . . slim fuel tank, stub fenders for rearward vision.

"Extras" are Standard Equipment. Push-button starter on instrument panel . . . decelerator pedal . . . automatic bucket level indicator.

Certified Permanent Lubrication. Heavy-duty, tapered roller bearing truck wheels, idlers, support rollers never need greasing. *True* unit construction lets you remove and replace any major part without disturbing adjacent assemblies. *Both these features exclusive* in this size tractor shovel.



For Extra Return on Your Investment... Quick-Change Attachments

The 6G's 1½-yd general purpose bucket is ideal for most digging, handling and loading jobs. Add bucket teeth and rear-mounted hydraulic ripper and you've got a machine that's built for business at *both* ends in extra-tough work. Interchangeable front-end attachments mount in minutes, quickly adapt your tractor shovel to do special jobs faster and at lower cost.

Count on your Allis-Chalmers dealer for operating advice, maintenance suggestions and 'round-the-clock service—when and where you need it. He'll help you get top performance and long life from your 6G or any other Allis-Chalmers machine you own . . . with genuine, factory-quality, regular production parts—made for the machine, best for the job. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

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A still finer workhorse in the 3/4-yard field!

Maine, Florida, Indiana, Louisiana and on west!—the 25-D Northwest is rapidly proving itself the finest, most versatile piece of equipment in the ¾-yd. field.

If you are considering a ¾-yd. machine, ask about the many advanced features of the 25-D. There's the New Independent High Speed Worm Boom Hoist, driven through Uniform Pressure Clutches; Power Load Lowering on the Hoist Line; longer, wider Crawlers; larger Drums for greater cable capacity; improved Uniform Pressure Swing Clutches; larger Drum Brakes and Clutches and; improvements in many other features that combine to make money.

A Northwest man will be glad to tell you the whole story.

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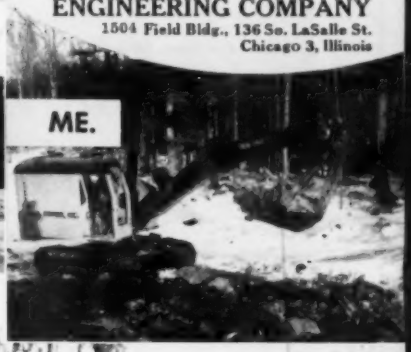

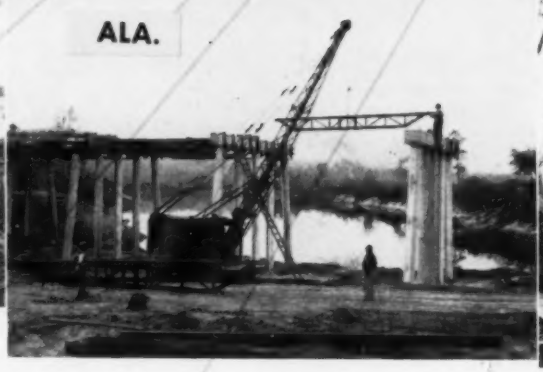

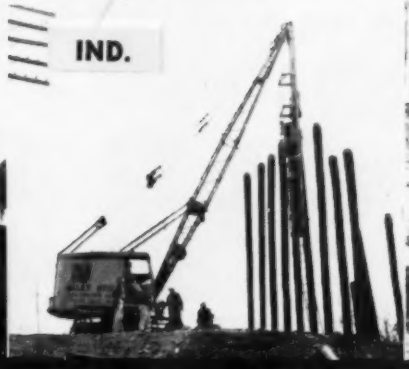

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⅜ Yd. to 2½ Yd. Capacity	13-Ton to 50-Ton Capacity	¾ Yd. to 3 Yd. Capacity	¾ Yd. to 2½ Yd. Capacity	25-Ton and 35-Ton Capacity

G-98-LCG

New Road Bonds Voted in Several States

The issuance of bonds to finance highway construction has been approved by 11 state legislatures so far this year. Also similar proposals were pending in four other states as of mid-July, a survey by the National Highway Users Conference showed.

The following list shows the amounts to be borrowed, mostly for matching federal aid but in some cases for farm-market roads (South Carolina) or state roads other than federal-aid.

State	*Amount*
Alabama	$ 60 Million
Arkansas	21 "
Connecticut	346 "
Delaware	2.5 "
Maine	13 "
Oregon	24 "
Rhode Island	45.650 "
Rhode Island	3 "
South Carolina	6.5 "
Tennessee	30 "
Vermont	3 "
West Virginia	5 "
	$559.650 Million

The bond issues authorized in Arkansas, Maine and Rhode Island require approval in a referendum before the bonds may be issued.

Although it took action on a bonding proposal earlier this year, the Alabama legislature now is considering a bill which would authorize bonds only after electorate approval as a constitutional amendment.

In addition to the above list, California proposals would authorize counties and cities to issue highway bonds upon approval of voters; additional two bills are pending in Delaware ($10 million to surface dirt roads, $20 million for state highways); a New Hampshire proposal would approve $86 million to help finance a proposed four-year accelerated highway construction program.

Also, several measures in Oklahoma would amend the constitution to authorize highway bond issues in amounts varying from $100 to $200 million. And a Wisconsin bill would authorize the issuance of bonds for expressways and state trunk arterial highways.

● The Pennsylvania Turnpike Commission has set a minimum speed limit of 35 mph on its road, as a means of further reducing rear-end accidents.

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This Cat No. 12 Motor Grader is undercutting banks down 28 inches deep in St. Anthony Village, Minnesota. Cutting both sides, it averages about 8 blocks a 10-hour day in compacted hardpan. Owner: J. A. Denens & Son, Inc., Minneapolis, Minn.

LOOK! THESE IMPROVEMENTS IN THE No. 12 PAY OFF IN EVEN HIGHER PRODUCTION!

Increased throat clearance and final drive **New blade, lift and circle** **One-piece case for transmission** **New, two-tooth power control clutches** **New, positive mechanical lock**

SINCE it was introduced twenty-one years ago, the Caterpillar No. 12 Motor Grader has earned the title "standard of the industry." Constant improvements have kept it the undisputed leader in its class. Here are the latest improvements that enable you to get even more work at lower cost with less maintenance from this high-production machine:

1 Clearance between the top edge of the blade and bottom edge of the circle has been increased to 5 INCHES. This provides improved rolling action, allows more material to move across the blade for greater production.

2 Blade thickness has been increased to 7/8 inch and blade beams have been increased in length and thickness to handle heavier loads. Lift arms have been lengthened and links shortened to enable operator to obtain all blade angles more easily. Circle reverse gear housing has been redesigned for better clearance as well as to increase the life of components and make service adjustments easier.

3 There's a new, stronger one-piece case for the transmission and final drive. This eliminates possible leakage at gaskets. In addition, transmission bearings have been strengthened for longer gear life.

4 New mechanical controls for reduced kickback, easier engagement. New power control clutches have two teeth, instead of four, and improved contact angles. They are more positive to engage, easier to hold in position.

5 New blade controls feature a positive mechanical lock—exclusive with Caterpillar. When the control is in neutral, the power shaft is locked by a set of gear teeth to prevent creeping.

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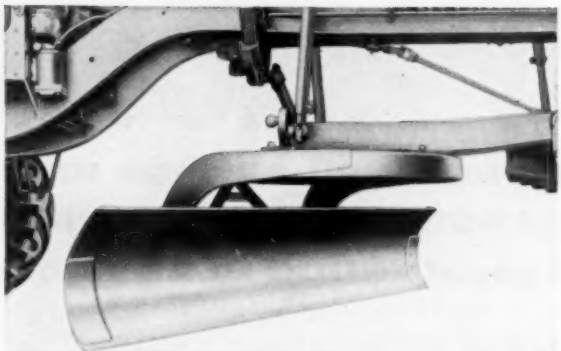

See the improved No. 12 at your Caterpillar Dealer. Whatever the job, he has the right capacity motor grader for it. Besides the 115 HP No. 12, there's the big new 150 HP No. 14 and 75 HP No. 112. Ask for a demonstration!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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STEP UP PRODUCTION WITH THE IMPROVED No. 12

Utah Interstate Project Puts—

CONTRACTOR IN "SAND DRAIN" BUSINESS

A project in the Salt Lake City area—with similar ones to follow—entailed a combination of vertical sand drains, transverse drains, sheet pile cutoff walls and shear trenches, in solving foundation problems for freeway through built-up industrial area.

Roads and Streets Staff Report

High interchange fills and other embankments are requiring special foundation treatment along sections of Utah Interstate Route 15 near Salt Lake City, Utah. Vertical sand drains are part of the answer, these "piles" being used to hasten consolidation and stabilization of ground overlying the soft deposits left by the gradual receding of Great Salt Lake.

In equipping for initial use of these drains in the region, Gibbons & Reed, Salt Lake City contractors, sought advice from contractors in other parts of the country as well as manufacturers and engineers familiar with sand drain installation. Eyeing other such projects (and with a second large job successfully bid) this firm moved in on the 2.4-mile project here described, with an array of equipment including a Lima 1201 crane and 100-ft. compression leads equipped with a 16-in. diameter sand mandrel and a McKiernan-Terry C-8 hammer.

Following are some of the highlights of this project, which includes 280,000 lin. ft. of vertical sand drains, 43,725 sq. ft. of steel sheet piling, 17,000 tons of special aggregate for transverse drains, and about a million cubic yards of roadway embankment. The bid price, $1,624,479.

The Utah project has had the benefit of guidance by consultants who have been pioneers in sand drain work and difficult roadway foundation

• Vertical sand drain operation—sand dropping into mandrel. Hopper has capacity of 6 yd. Crews are able to drill a 70-ft. hole about every 12 minutes.

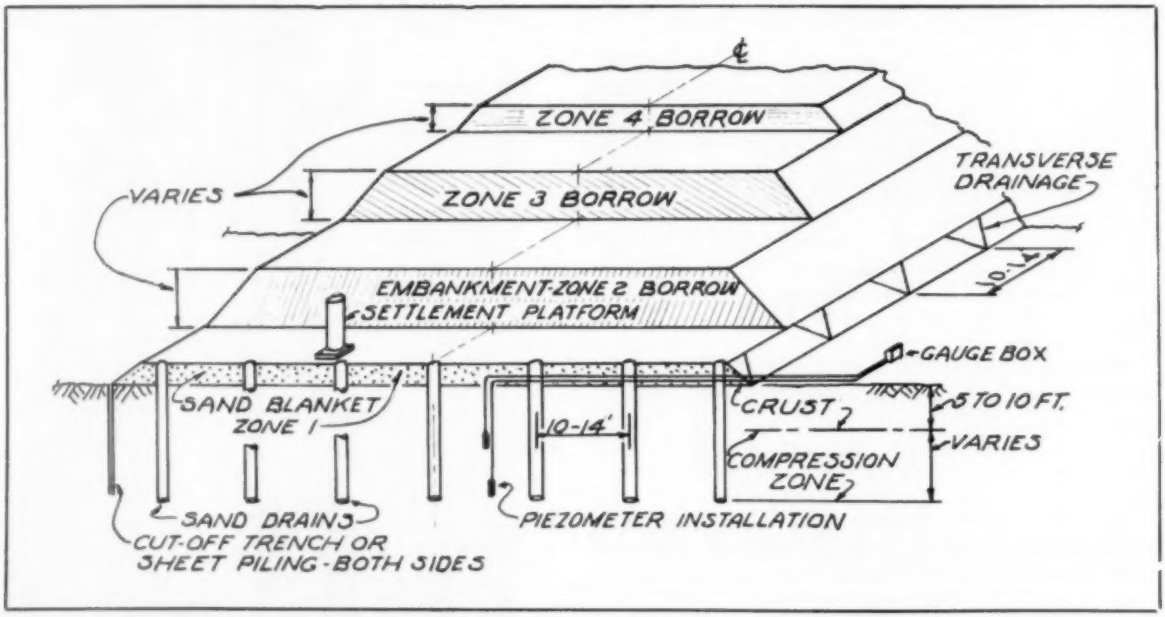
● Sheet pile wall in place along adjacent motel property. Zone 2 embankment is seen being placed beyond piling.

● Contractor found native soft wood (19" x 8") gave satisfactory service as hammer cushion blocks, lasting from 5 to 8 hours.

problems. Under the policy of the Utah State Road Commission of employing consultants for special projects, Porter, Urquhart, McCreary & O'Brien received the engineering contract for the project in association with Caldwell, Richards and Sorensen of Salt Lake City.

An extensive exploratory drilling program for the project indicated that beneath 5 to 20 ft. of desiccated crust was 30 to 70 ft. of soft, saturated, compressible clay. After due consideration, it was recommended that vertical sand drains be utilized to accelerate the consolidation of these soft materials.

The engineering problem was not only to design a good highway but also to protect valuable adjacent property. In one area a 710-lin. ft. sheet pile wall was driven 50 to 60 ft. beneath the surface along the right-of-way line to protect a motel. An added precaution was taken to insure against lateral pressures which might tend to displace the protective wall wideways toward the motel. This was accomplished by 5-ft. sections of sheet piling placed as deadmen in the highway embankment and tried to the sheet pile wall with $1\frac{3}{16}$ or $1\frac{1}{4}$-in. tie rods.



● Figure 1—Oblique view of scheme which includes vertical sand drains, lateral drains through platform layer, and various fill zones.

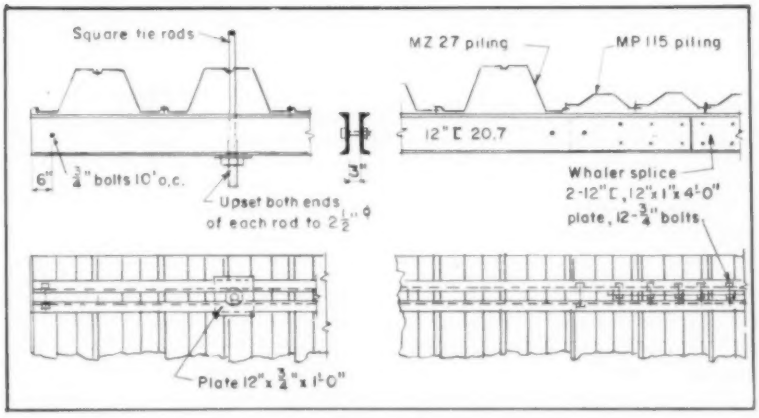
● Salt Lake City Interstate freeway, sand drain operation. Sand being dumped into hopper by Michigan 175A loader preparatory to being raised and dumped into mandrel. Hopper has capacity of 6 yd. but is loaded with 3 to 4 yd. for this depth. Left to right: Clarence Heavlin, pile foreman, Gibbons & Reed; Edward D. Kennelly, resident engineer, state road commission; and Grant Collett, assistant superintendent, Gibbons & Reed.

● 18-in. diameter by 1½-in. thick steel driving shoes were made up on the job. ½-in. wire rope allowed shoe to hang below bottom of mandrel when being pulled up.

For less critical areas a shear trench was decided upon. It was found that the width of the shear trench was not important; it simply must provide a shear plane separating the loaded area from the adjacent area. The theory involved was that the shear plane would cause the differential settlement to occur at the toe of the slope rather than possibly causing dragdown and settlement somewhere on adjacent private property.

An associated problem was the control of blow-ups during construction. The piezometer and settlement platform installation is shown in Fig. 1. By separate contract, Porter and associates collaborated with engineers in the Utah road commission to interpret readings of subsurface pressure and settlement, as a means of keeping pressures within safe limits under controlled filling operations. Whenever high pressures built up, the rate of fill was slowed down. If the pressure were allowed to build up too fast in the compressible zone it would likely create a slip plane which could result in a blow up, allowing the soft subsoil to heave up the adjacent ground.

Porter's engineers likened the situation to that of placing pressure on a rubber balloon filled with water, in that the balloon (or adjacent ground) would displace itself in the unpredictable direction of least resistance.



● Figure 2—Typical details of sheet pile wall and anchorage.

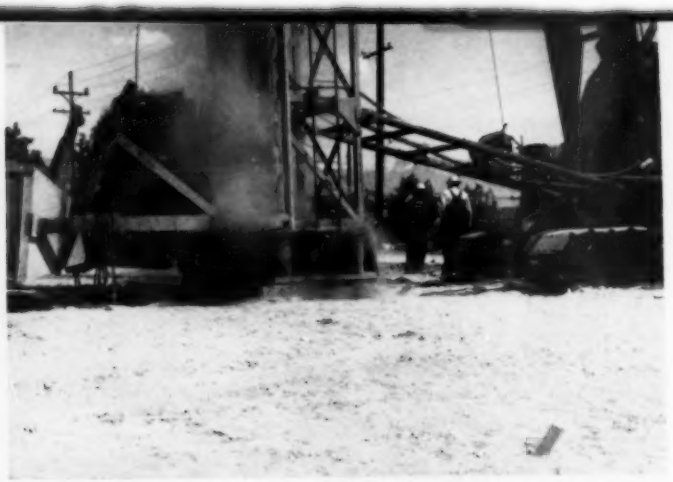
● *Construction Procedures.* For the contractor, sand drains involved new equipment, and new techniques as well as a new estimating and cost-gauging problem. The result; the new Lima 1201 and the hiring of Clarence Heavlin as pile foreman to work under job superintendent Lee Bryner.

Heavlin's crew consisted of the crane operator, 4 pile butts, one oiler and a front-end loader operator. Heavlin operated on the basis of a minimum of bossing; he saw to it that the crew knew their jobs and then left it up to them to produce results. The results were considered quite satisfactory: 1,800 lin. ft. of sand drains installed per 7-hour shift was the average. The best day was 57 drains, about 3,200 lin. ft.

Since the project crossed a number of high-voltage lines, down-time for moving was an important factor. Removing the hammer and mandrel and bottoming the 100-ft. leads took about 6 hours; moving and setting up, another 6 hours.

Compressed air from two Ingersoll-Rand 600 cfm units (on rear of the Lima) supplied the hammer and maintained pressure within the mandrel. The

● **Mandrel driver, Lima 1201 with McKiernan-Terry 100-ft. leads and C-8 hammer. Two Ingersoll-Rand 600 cfm compressors supplied air.**



● **Miniature explosion, seen as mandrel is withdrawn, was evidence of air pressure on sand to insure proper placement as mandrel was withdrawn.**

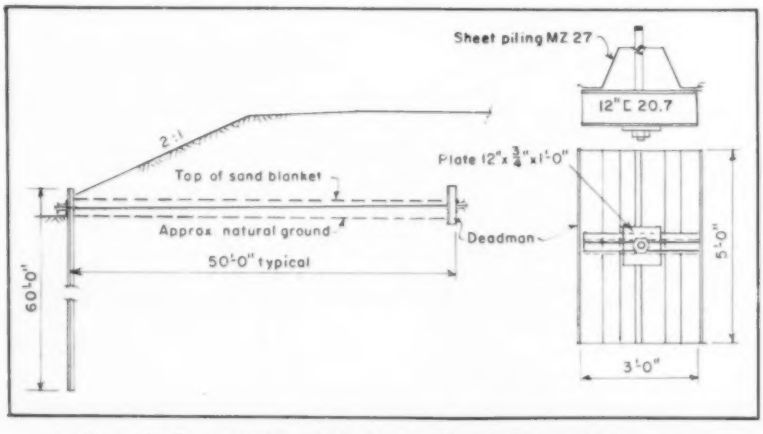
● **The steel driving shoe, seen hanging below mandrel, was cleaned of muck from previous drive before starting new drain.**

loader filled the skip while the mandrel was being driven. The skip emptied into the air lock when the pile was about half way down. About 80 to 100 psi of air pressure was then applied above the sand to help force it out of the mandrel as the pipe was drawn upward from the bottom. This pressure was relieved somewhat as the mandrel was withdrawn, but remained sufficient to cause a miniature explosion when the bottom of the mandrel reached ground level.

The 18-in. diameter driving shoe was fastened to the bottom of the mandrel with about 3-ft. of ½-in. wire rope, so that it could fall free from the mandrel as the mandrel was withdrawn. The shoe was kept in place during the driving by the 4 webs shown in the accompanying photograph. Heavlin stated that the flat shoe had the advantage over the pointed shoe of not being pushed off line so easily if a rock or other hard object was encountered.

The only trouble with depositing the sand occurred when wet sand or insufficient air pressure was used. Failure to properly fill the pile with sand called for driving another drain at no extra cost.

The contractor used an acetylene outfit to produce most of the repair parts on the job. Driving



● **Figure 3—Cross-section of fill showing sheet pile wall and anchorage.**

Why Vertical Sand Drains? How They Work, and How They are Commonly Installed

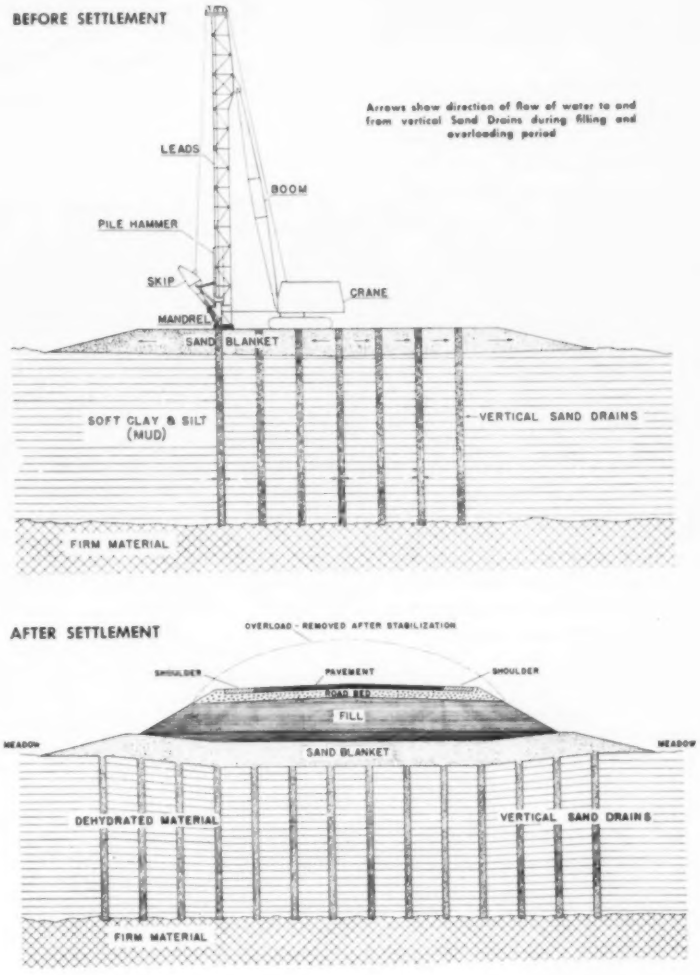
When a highway, airfield or earth dam is to be built over ground having high water content and low shear strength—ground that is highly compressible—it is first necessary to settle and stabilize the ground. This is to avoid "mud waves," evidence of lateral displacement of the foundation material, and complete the foundation settlement during the construction period.

This can be accomplished variously. The foundation area can sometimes be confined to sheet-piling and fill pumped in. A hydraulic fill may be placed, after first excavating down to clay pan or hard pan. A plank floor on closely spaced piping may suffice; or a concrete or wood pile trestle be built at submerged elevation. Another device is a blasted trench, refilled with pumped or trucked-in material.

Vertical sand drains as a substitution for the above costly methods often is substantially the cheapest way to stabilize soft, marshy ground where the depth is 10 to 100 ft. or more. Compression and settlement of the underlying silt may be achieved in a year or two, rather than slowly over a very long period.

Vertical sand drains are columns of sand or other granular material, of definitely porous, controlled gradation, which are placed on a grid spacing over the foundation area. These "piles," in conjunction with a 2 to 8 ft. thick sand blanket or working platform, will help ground water squeeze out more readily under embankment or temporary surcharge load. The soil being usually laminated, releases water along horizontal bedding planes, and this water escapes upward through the vertical sand drains and blanket.

Sand drains must be placed and the overlying weight built up under the direction of someone experienced in this special field of foundation engineering. Settlement of platforms with gauges and for taking pore pressure readings and elevations are required in the control.



Placing of the drains involves punching or reaming holes of 12 in. or greater diameter into the ground. While some have been auger-bored, the greatest experience has been with equipment (crane, special leads, pile hammer and sand skip) which punches into the ground a steel pipe mandrel. This pipe is equipped with a hinged, flat steel plate on the bottom. The plate opens as the pipe is withdrawn. As the pipe comes up, sand is fed and air-forced to fill the hole and leave a column of free-draining material after the mandrel is drawn free.

The sand columns are usually placed on 6 to 20 ft. centers, depending on the engineer's analysis and judgment. Water escapes rapidly around the periphery of the area, as filling progresses. Settlement of as much as 20 ft. in extreme cases is thus obtained during a controlled period of filling.

---

shoes and air lock gates were the items most frequently replaced.

Another spare item of interest was the cushion blocks cut from dead cottonwood logs. For this special use, Heavlin found these to be a satisfactory substitute for the hardwood cushions which came with the leads. Normal practice was to install new blocks at noon and between shifts.

The Michigan loader used the time between sand "pile" work to keep the working area smooth by dragging the loading bucket backwards.

Edward J. Kennelly was resident engineer for the state.

Better Qualified Distributor Personnel

Object of new college course offered under AED cooperation

A new type of managerial ability in companies which sell machines to the construction industry, is the goal for the college curriculum at Clarkson College of Technology, Potsdam, New York.

This school has developed a teaching program in cooperation with the Associated Equipment Distributors, national trade association of machinery dealers in the construction field. Members of the AED have realized that distributors will need highly-trained men for sales engineering and management positions in the years ahead, to intelligently advise and service their contractor customers.

● As a result of this combined effort between leaders in education and industry, the young man who enters the Construction Equipment Distribution curriculum this fall will tackle a unique program that features courses specifically designed to give specialized training. He will hurdle such subjects as: "Construction Equipment," "Highway Construction," "Soils Engineering," "Transportation and Public Service Facilities," and "Construction Organization."

In the area of Business Administration, he will finance and credit, salesmanship, marketing and merchandising, business law and business procedures.

All told, by the time he receives his Bachelor of Science degree in Construction Equipment Distribution, the graduate will have accumulated 32 semester hours of engineering, 30 hours of basic sciences (mathematics, chemistry, physics), 27 hours of liberal studies and 14 hours of military science, physical education and electives.

During the summers between his school years, the undergraduate will have an opportunity to get "mud on his shoes" through on-the-job training. Distributors will provide summer employment for the students so they can get actual experience to go along with their classroom work.

Clarkson has as its goal for this fall an enrollment of 30 such freshman students. The college is primarily interested in attracting sons of distributor company owners or their employees, younger personnel in a distributorship, and the sons of contractors who are familiar with the industry and would like to make distribution their career.

According to an AED spokesman, several other schools are taking a hard look at Clarkson's pioneering efforts, with an eye towards establishing a similar course. Among these are Texas A. & M., Bradley University (Peoria, Ill.), Western Michigan, Ohio State University and the University of Portland (Ore.).

AED's Education Committee is headed by Chairman O. E. Capehart, Boehck Engineering Co., Inc., Houston, Texas.

Those seeking additional information about the program should contact Professor Harry J. Waters, Clarkson College of Technology, Potsdam, New York.

STRENGTH IN SHEAR OF BEAMS WITHOUT WEB REINFORCEMENT. By M. A. Sozen, E. M. Zwoyer, and C. P. Siess. Engineering Experiment Station Bulletin No. 452, University of Illinois, Urbana, Illinois. Price $1.00.

The purpose was to obtain a better understanding of the behavior of prestressed concrete beams without web reinforcement. Tests of 43 rectangular and 56 I-beams are described and analyzed. The investigation showed that such beams are vulnerable to shear failures. Unless web reinforcement is provided, the useful strength of such beams is limited to the inclined cracking load which may be only a small fraction of the flexural capacity.

D6 builds mountain road to Portland Reservoir

Portland, Oregon, gets its supply of pure, soft mountain water from the Bull Run River . . . 30 miles east of the city. The river has its source in Bull Run Lake near the summit of the Cascades . . . elevation 3,175 feet. The uninhabited, 218-square-mile area is heavily-timbered, rugged terrain. To repair a dam at Bull Run Lake required carving out 5 miles of new road.

A Caterpillar D6 Tractor with a No. 6A Bulldozer and a Hyster donkey did the job . . . rough grading, ditching, clearing boulders, skidding logs, spreading crushed rock. All this plus general maintenance jobs such as winching logs from the lake and river.

The versatile D6 outworks any tractor in its size range. It combines high production with low operating and maintenance costs.

The 93 horsepower Caterpillar Engine delivers the push and pull to make the hard work easy: the engine's foul-proof fuel system runs on economy-type diesel fuels.

The D6 is fast . . . speeds up to 6.6 MPH . . . and easy to operate. A hydraulic unit takes the effort out of steering, helps the operator work at top efficiency.

The exclusive Caterpillar oil clutch goes up to 2,000 hours—one whole season—without adjustment. When other type clutches need *replacing*, a Caterpillar oil clutch may need an *adjustment*.

All of these features on the D6 combine to give you a profitable return on every dollar invested. And for added versatility . . . there's a complete line of attachments for the D6.

You could be missing out on a machine valuable to your operation. A demonstration on your job will show you why the D6 is the work horse on so many earthmoving jobs. Call your Caterpillar Dealer soon. He'll give you the full story . . . top production facts and figures.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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Editorial

We Need a New Crusade

One reason Congressmen dragged out their decision on the Interstate road program, we are told, is that an apathetic public failed to make its wants felt in Washington. The mailbags were heavy with letters from construction industry people. But few wrote in as ordinary citizens.

Actually the public is far from apathetic over freeways, if its patronage of this type of highway means anything. Prompted by a chance phone conversation with a contractor, the publishers of Roads and Streets during August addressed a last-minute letter on this subject to every member of both houses of Congress—a sequel to the "Open Letter" (see our May issue) which was also mailed to all members and made available as reprints for our readers to use.

This latest letter, mailed August 12, is reproduced at right. The contractor who suggested it is Blair Rieth, of the well-known Indiana road-building firm, Rieth-Riley Construction Company.

By the time you read this page, the Congressman will have made their decision on the Interstate road financing and adjourned. Whatever their decision, those who know the importance of a continuing high-level road program for this growing nation, should start hunting for new selling ideas.

We haven't found a way recently to set people on fire over the road program. The program is too big, too impersonal.

Will someone please come up with a sequel to the "Get the farmer out of the mud" idea which stirred the hearts of millions.

Dear Mr. Congressman:

Before you make your final decision on the Interstate highway program financing, we wonder if you have fully considered three very provocative points:

Firstly, the public desire for roads of the freeway type, such as the Interstate program is just beginning to provide.

The toll roads, our best examples of long, continuous stretches of such roads now in service, are enjoying a booming patronage. Almost without exception the turnpikes are handling a record flow. Motorists and truckers are willing to pay a toll equivalent to an additional 25 cents a gallon of gasoline to use such roads. Many daily travel miles out of the way, in order to make at least part of their trips over these safer, more comfortable and time-saving highways.

The endorsement has largely escaped noticed in the recent hearings. If you are looking for "grass roots" evidence of the desire for a really modern highway system in America, here it is.

Secondly, an astonishingly small part of family car ownership cost goes to pay for the roads and streets. The gross annual highway expenditure at all government levels today, including debt service, is only a small fraction of this expense. More money goes for accident loss than for roads. More for depreciation of vehicles. More for car insurance.

The sum needed now to keep the Interstate program on keel deserves to be considered in this perspective.

Thirdly, please consider the havoc which an abrupt drop in the program will create among the contractors, manufacturers and suppliers—employers, all. These people have come through with increased production capacity to support and carry out the program as Congress set it up only two short years ago. The program has just reached high gear.

Some solution surely can be found to keep this vital program on schedule.

Sincerely,
ROADS AND STREETS
H. S. Gillette
Vice President

Ready-Mix Firm Subs Paving Concrete

(See Front Cover)

Shown on the front cover of this issue is a Rex portable concrete plant, one of two owned by Winkworth Fuel & Supply Co. of Detroit, ready-mix firm serving a considerable area of southern Michigan.

This type of plant is making news by doing highway paving jobs that recently would have been restricted to pavers. During the 1959 summer the Michigan state highway department issued a supplemental specification permitting centrally mixed and truck-transported concrete under some conditions.

The Winkworth firm serves as concrete supplier for the prime contractor on road paving and widening and related work, handling a number of such jobs this year in Southern Michigan. The management will be disappointed if each of its two Rex portable plants produces less than 30,000 cu. yd. of concrete during the working season. Each plant is built around a 3-yd. tilting mixer. The company's plants are moved up to six times per season, the move being expeditiously done because of the sectional design. Maxon Dumpcrete truck delivery to the road grade are used in conjunction.

The reason for this type of operation, according to a Winkworth spokesman, is the desire by the prime contractor to secure large daily pours with minimum equipment cost, which cannot always be achieved on relatively short or intermittent paving stretches. Some of them have found it advantageous to let a firm such as Winkworth move in a plant, make the pours, and move out, leaving other phases of the job to the prime contractor.

Michigan's New Specifications

The following supplemental specifications for central-mixed concrete for concrete pavements was issued during the 1959 summer by the Michigan state highway department.

Central Mixed Concrete, meeting the requirements specified herein, may be used for the construction of Concrete Pavement. (All the other requirements for concrete pavement construction as specified in the 1957 Standard Specifications shall apply).

Mixers and Batching Equipment. Central mixed concrete shall be mixed in a stationary mixer or in a paver operated as a stationary mixer. The central mixing of concrete shall be done at the site of the work or at a site approved by the Engineer. During paving operations, no concrete from the central mixing plant shall be supplied for any other construction.

● Concrete mixed in a stationary mixer shall be completely mixed before being discharged into the hauling equipment. The mixing time for mixers having a capacity of 1 cubic yard or less shall be not less than 1 minute. For mixers of larger capacities, this minimum shall be increased 15 seconds for each cubic yard or fraction thereof of additional capacity. Mixing time shall be measured from the time all cement and aggregates are in the drum. The batch shall be so charged into the mixer that some water will enter in advance of cement and aggregate, and all water shall be in the drum by the end of the first one-fourth of the specified mixing time. The amount of concrete that may be mixed at one time shall not exceed the capacity of the mixer as recommended by the manufacturer and stamped in metal on the mixer.

When the concrete is mixed in a paver, the volume of concrete per batch and the mixing requirements shall be as specified in Article 4. 14. 03-j of the Standard Specifications.

The weighing and batching equipment shall be of a capacity sufficient to weigh, in a single weighing, the entire amount of each material required for a batch of concrete to be mixed at one time.

● *Hauling Equipment.* The concrete may be transported from the Central mixer to the site of the work in non-agitating truck bodies, provided the period of time elapsing from the time of mixing until the concrete is deposited at the site of the work is not more than 30 minutes.

If the time between mixing and depositing the concrete at the site of the work is more than 30 minutes, the concrete shall be transported in truck bodies with mechanical agitators; provided, however, that in no case shall the time between mixing and depositing the concrete at the site of the work exceed one hour. The truck bodies shall be of a type designed to transport freshly mixed concrete. Dump boxes with square corners and transit mixers will not be permitted for the hauling of central mixed concrete for this work.

The Contractor shall provide and use a ticket system for recording the transportation of batches from the mixing plant to the site of the work. A ticket shall be issued to the truck operator at the mixing plant. Each ticket shall show the quantity of concrete and the time of discharge of the freshly mixed concrete into the hauling equipment. The ticket accompanying each load of concrete shall be delivered to the Inspector at the site of the work at the time of delivery of the concrete.

● *Quality of Concrete.* Central mixed concrete shall conform with the requirements as specified in Section 4.14 of the Standard Specifications.

The Department reserves the right to require the Contractor to discontinue the use of central mixed concrete and use a portable mixer of the batch type operated at the site of the work if, in the opinion of the Engineer, the use of central mixed concrete does not produce satisfactory work, and no claim will be considered on account of such change.

● *Method of Measurement and Basis of Payment.* Concrete Pavement will be measured and paid for as specified in Section 4.14 of the Standard Specifications.

Soil Cement Used in Wyoming Maintenance

Soil-cement road bed stabilization is being used in Wyoming on a section of U. S. 85 northeast of Cheyenne. According to W. E. Sutton, state highway maintenance engineer, the method is being considered where adverse soil conditions have resulted in high maintenance cost—as, for example, where the roadbed has failed as the result of underlying clay becoming wet.

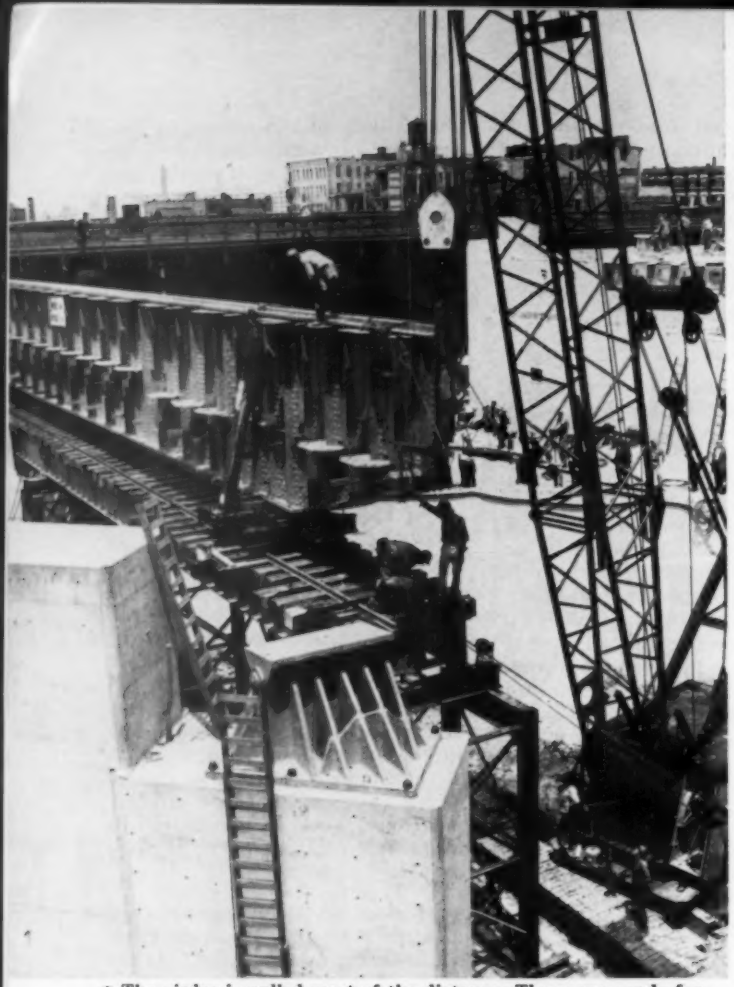
Previously when this occurred, it was necessary to remove the road surface and haul in gravel, sometimes for a considerable distance, to build up and strengthen the roadbed. Using soil-cement processing, enough cement is spread over the roadbed to give a 4 percent mixture with the clay. Water is then added to set the mixture, and a seal coat of oil is applied.

The oil mat top surfacing is then replaced and the section of road may be opened to traffic. In completing this test section of road, only state highway maintenance equipment was used.

How Heavy

Step-by-Step report on the tricky work of "noodling" a 375,000-pound, 126-foot steel girder through Chicago streets and bringing it to rest on its pedestals.

By James R. Cummings
Assistant Editor, Roads and Streets



● **The girder is pulled most of the distance. The crane, ready for the lift, takes over steadying of the big beam as a workman prepares to loose guy cable on this side.**

● **One end of the 187-ton girder is lifted by two 60-ton cranes from railroad flatcar to lowboy trailer.**

They nudged, angled, pulled, squeezed, and held their breath. And finally it was in place—the heaviest steel girder ever shipped in one piece by American Bridge Division, of U.S. Steel and probably the heaviest single structure unit of its type ever erected in Chicago.

The unit was a 187-ton girder 126 ft. long and 13 ft. high, fabricated for a triple deck grade separation on Chicago's Northwest Expressway. The big beam is to be matched with a similar but slightly smaller unit to form a box girder. When mounted on reinforced concrete columns it will support some 60 smaller girders which in turn will support ten tracks of the Chicago and North Western railroad.

Fabricated at the division's plant in Ambridge, Pennsylvania, the massive girder required special handling during its trip to Chicago. The section was mounted on three flat cars. Because of its outsize dimensions it was permitted to be moved only at slow speed and during daylight hours.

Arriving in Chicago, the 3-car carrying rig was shunted to a siding about seven blocks from the overpass site. An unloading spot was picked with plenty of room to maneuver with cranes and trucks.

A separate contract for moving the girder from the railroad yard to the erection site was let to J. Artim & Sons, Hammond, Indiana. With two Manitowoc 3900 60-ton cranes, the girder was

Girder Was Moved and Set

● Two inches to spare beneath this underpass. Engineers had to plan well in advance for a route which would accommodate the truck-girder-truck rig.

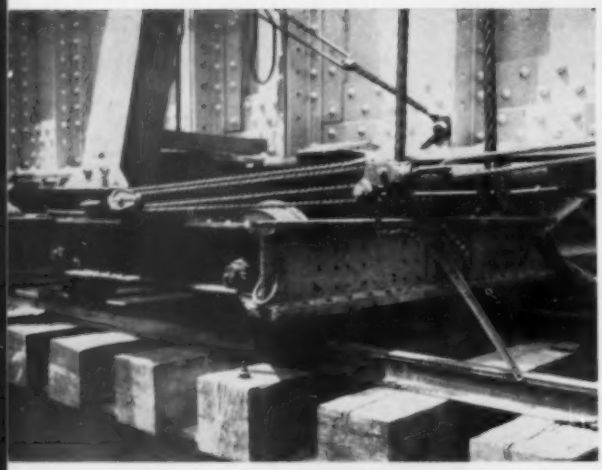
● View of the erection site. Girder has been raised to the temporary track and one end protrudes through the trestle. Photo was taken from other trestle which, with the structural work already completed, hemmed in the site. Supporting shoes for the girder can be seen at left and at right near girder end.

lifted, one end at a time, and placed on two multitired lowboy trailers placed end to end—Diamond T 830 and Mack B60 tractors with two Rogers 75 trailers.

The trailers were driven in tandem taking the load to the site. As might be expected there were several tight squeezes; the girder passed under one overpass with 2 in. to spare. Turning corners was especially tricky, with some stop signs requiring removal.

Because the girder was to be erected in a limited space between two sets of C&NW commuter line tracks, construction materials and equipment had to be brought to the site through a maze of trestles and temporary supports. After other avenues for bringing the girder into position were ruled out because of foundation conditions, diagonal bracing was taken out of a section of the trestle. Then a temporary materials track was built to carry the girder the final 200 ft. through the trestle to a point alongside the two reinforced concrete supporting columns.

● From the other end. Timber blocking here is a precautionary measure until the unit is pulled far enough onto track to be supported entirely by the 100-ton push car. Caterpillar Traxcavator pushed the blocking ahead until track was reached.



● Close-up of push car arrangement.

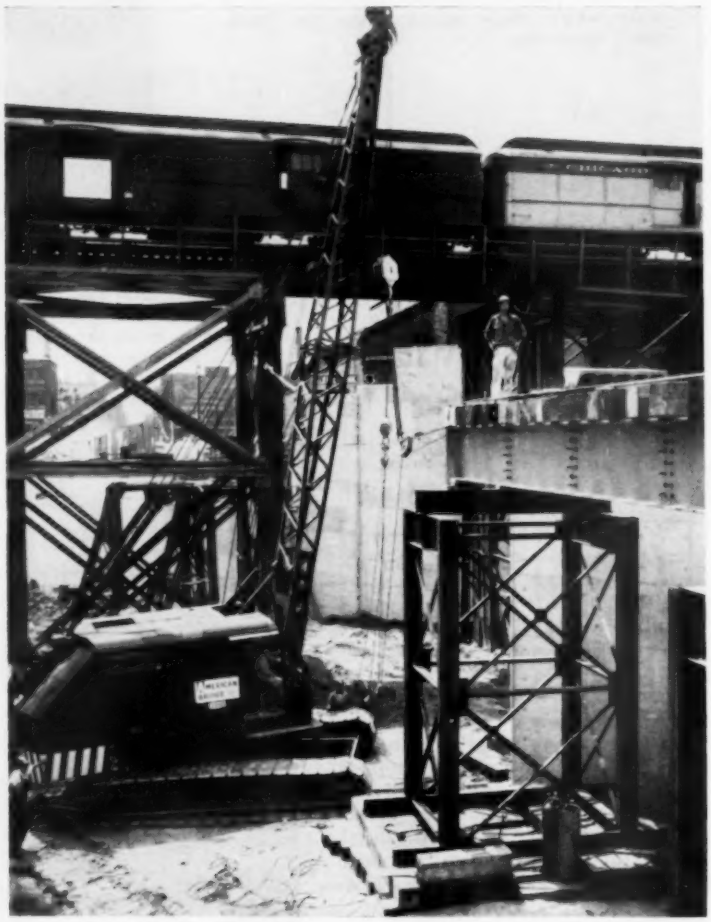
● The end of the girder extending through trestle is steadied by guy cables. Far end is being held by 125-ton crane. Visible in foreground is part of winch and cable arrangement which pulled the girder forward.

● A tractor grades the ground to provide level footing for the crane's lifting chores.

When the truck-girder-truck combination reached the construction site a Manitowoc 4000 125-ton crane lifted one end from the first truck and placed it on a 100-ton railroad push car. As this front end started into the "tunnel" beneath the trestle, the back end was swung on a second push car. With only a bare clearance on top, the girder was pulled at a crawl speed by carefully controlled winches on one of the 3900 cranes.

While the girder was on this last short trip, the big crane moved around to the other side of the trestle and was fitted with a lifting

(Continued on page 75)



● 60-ton crane was positioned at far end of track for straight-line pull. Workman on track relayed signals to operator.

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Davison's rigs move more payload in less time

J. K. Davison & Bro., Pittsburgh, one of the largest ready-mix purveyors in western Pennsylvania, is supplying concrete for the Steel City's gigantic new civic-sports arena.

To increase the capacity of their ready-mix fleet, Davison recently purchased two high-payload Diamond T trucks with 8-yard mixers, 212 hp engines, Fuller Model 5-A-65 5-speed Transmissions and Eaton-Hendrickson Model 38DS Tandem Rear Axles.

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● Lifting hitch is fitted to girder end for final lift into position on rocker shoe, foreground.

● Ugh! . . . made it.

● The girder in place, with part of Chicago's Loop as a backdrop.

BIG GIRDER MOVED

(Continued from page 70)

load block and 8-part line. The girder was halted while a lifting hitch was fitted to the front end.

When finally in position, the girder was lifted, one end at a time, to the steel shoes mounted on the columns. One shoe, a 14-ton rocker, will permit expansion of the finished box girder. The other 171½-ton shoe is fixed.

Steel erection at the overpass is scheduled for completion sometime during the 1959-60 winter.

G. R. Carter is district construction manager of American Bridge Division. W. M. Scheffler is assistant to the construction manager. J. C. McMurray was superintendent at the job site and office engineer G. T. Burroughs drew up the erection scheme.

STRENGTH OF CONCRETE UNDER COMBINED TENSILE AND COMPRESSIVE STRESSES. By Douglas McHenry and Joseph Karni. Portland Cement Association, 33 West Grand Ave., Chicago 10, Illinois.

This report, an authorized ACI Journal reprint, covers results of tests on hollow concrete cylinders subject to (1) pure compression, (2) pure tension, and (3) combinations of tension and compression.

SELECTING THE Right Truck Size

You may be using less-than-the-most profitable combination of haulers and excavator. This analysis shows how to fit hauler size to bucket size.

By R. L. Peurifoy

TRUCKS and other earth hauling units are available in many sizes, each of which has advantages and disadvantages when considered for use with a given excavator, or for a given project. With the handling of earth so competitive and with the margin of profit on this work limited by competition, it is highly desirable for a contractor to know with dependable accuracy which size of haulers should be used on a project. A contractor must limit his investment in hauling equipment; and he should select trucks which will enable him to excavate and haul earth at the lowest practical cost. A cost difference of only two cents a cubic yard will amount to $20,000 for a 1,000,000-cu.-yd. project.

This article is intended to illustrate a method of determining the cost of excavating and hauling earth using two sizes of power shovels and three sizes of hauling units.

It will be noted that where a larger size shovel is used to excavate the earth and load trucks, the use of larger trucks is more economical than small sizes. While conditions, which are subject to changes from job to job, may alter the results obtained from these studies and analyses, the methods illustrated may be applied to any job and to any equipment, provided the conditions for a given job are reasonably known in advance.

The production rates for the shovels, time cycles, truck capacities, truck cycle times, and other information used are based on studies which have been made for the type of job and equipment analyzed. The results obtained do not necessarily apply to a job for which the conditions are different.

In all calculations and uses the volumes of earth are based on bank measure. The trucks are indicated by the rated nominal sizes, with the truck capacity given for each size. The average volume per load, based on the heaped capacity, with the loose volume converted to bank measure, is given for each size.

Job Conditions. The job conditions are assumed as follows:

- Material, sandy clay.
- Swell, 32 percent.
- Depth of cut, 8 to 14 ft.
- Length of haul road: one way, 2.64 miles.
- Condition of haul road: maintained earth, with sprinkling when necessary, to give an average rolling resistance of approximately 90 lb. per gross ton of load.
- Average grade of haul road: minus 3 percent for the loaded trucks, or plus 3 percent for the empty trucks.
- Average truck speeds, loaded 22 mph, empty 26 mph.
- Loading conditions at the shovel: trucks may be spotted on both sides of the shovel.
- Conditions at the dump: the trucks, all rear dumps, may back into position with little or no delay.

Equipment. The equipment used on the project, for which this study applies, is as follows:

Power shovel No. 1, a 1½ cu. yd. diesel, crawler mounted.

Average volume per dipper load, 1.25 cu. yd. (bank measure).

Per cent of rated capacity of dip-

Truck Sizes Assumed, Cubic Yards

Nominal size	Struck capacity	Average heaped capacity	
		Loose measure	Bank measure
6	5.92	7.65	5.78
10	9.84	12.24	9.27
15	15.10	19.60	14.84

Assumed Equipment Costs Items

Equipment	Equipment cost	Operator or driver	Oiler	Total cost
1½-cu.-yd. shovel	$11.50	$3.25	$1.90	$16.65
2½-cu.-yd. shovel	22.50	3.25	1.90	27.65
6-cu.-yd. truck	3.80	2.25		6.05
10-cu.-yd. truck	6.50	2.25		8.75
15-cu.-yd. truck	11.00	2.25		13.25

FOR YOUR EXCAVATOR

per, 83.3.

Average angle of swing, 84 degrees.

Power shovel No. 2, a 2½ cu. yd. diesel, crawler mounted.

Average volume per dipper load, 1.94 cu. yd. (bank measure).

Percent of rated capacity, 78.

Average angle of swing, 84 degrees.

Truck sizes, all in cubic yards, as shown in Table at left.

Cost of Owning and Operating Equipment. The cost of owning and operating equipment includes depreciation, maintenance and repairs, taxes, insurance, interest on the investment, storage, fuel, lubrication, and operator wages. The cost of wages includes base pay plus fringe benefits. The costs per hour are as tabulated.

Analysis of Performance of 1½-yd. Shovel. Table 1 gives the average cycle time for the shovel, including the average time per cycle for minor delays. The average time for minor delays is less for the larger trucks because of the larger target for dumping and the less frequent delays resulting from fewer truck exchanges. Item 5 is the minimum average time for a dipper cycle, excluding all delays.

Table 2 gives the average production rates for the 1½-cu.-yd. shovel when loading different sizes of trucks.

Table 3 gives the average time required for a round trip by a truck, including (1), fixed time, accelera-

TABLE 1.

Average Cycle Time (Seconds) for 1½-yd. Shovel

Item	Nominal size of truck, cu. yd. 6	10	15
1. Load dipper	9.2	9.2	9.2
2. Swing to dump	3.8	3.8	3.8
3. Dump	3.0	3.0	3.0
4. Return	5.1	5.1	5.1
5. No delay time	21.1	21.1	21.1
6. Minor delays	16.4	15.0	13.8
7. Cycle time	37.5	36.1	34.9
8. Cycle time in minutes	0.625	0.602	0.582

TABLE 2.

Average Production Rates for 1½-yd. Shovel

Size truck, cu. yd.	Number of cycles Per min.	Per hr.	Production, cu. yd. (1) Per min.	Per hr.
6	1.60	96.0	2.00	120.0
10	1.66	99.6	2.07	124.2
15	1.72	103.2	2.15	129.0

(1) The volume is bank measure.

TABLE 3.

Average Time per Round Trip for a Truck, Excluding Loading Time, in Minutes

Size, cu. yd.	Fixed	Minor delays	Travel	Total
6	1.8	1.1	13.3	16.2
10	2.3	1.2	13.3	16.8
15	2.7	1.4	13.3	17.4

TABLE 4.

Time Required to Load Each Size Truck

Size, cu. yd.	Maximum volume, cu. yd.	Volume per dipper, cu. yd.	No. dippers required	Time per dipper, min.	Loading time, min.
6	5.78	1.25	4.61 (5)*	0.625	3.12
10	9.27	1.25	7.41 (7)*	0.602	4.21
15	14.84	1.25	11.88 (12)*	0.582	6.98

TABLE 6.

Earth Hauled per Truck per Hour

Size, cu. yd.	Volume per load, cu. yd.	No. trips per hour	Volume per hour, cu. yd.
6	5.78	2.59	15.0
10	8.75	2.38	20.8
15	14.84	2.05	30.4

TABLE 9.

Required Investment in Trucks

Size, cu. yd.	No. trucks required	Cost per truck	Total investment
6	8	$11,000	$ 88,000
10	6	23,000	138,000
15	4	33,700	134,800

tion, deceleration, turning, dumping, getting into and out of loading position, etc., (2), minor delays, and (3), travel time, but excluding loading time, which will vary with the size truck.

Table 4 gives the average time to load each size truck, based on the number of dippers required and the average total cycle time per dipper. Since the cost of a very large truck, which cost continues during the time the truck is being loaded, is substantial, the cost of this truck time is significant when the truck is loaded with a small shovel.

The numbers in the parentheses in table 4 indicate the dipper loads actually deposited in the trucks. The volumes for the 6- and 15-yd. trucks will be as stated, while the volume for the 10-yd. trucks will be

$$9.27 \times \frac{7}{7.41} = 8.75 \text{ cu. yd. per load.}$$

Table 5 gives the average total time required for a round trip by a truck, including the time required to load a truck. It is assumed that the trucks will operate an average of 50 minutes per hour.

Table 6 gives the average volume of earth hauled per hour by each truck.

TABLE 5.

Total Time per Round Trip, Including Loading Time, and Trips per Truck per Hour

Size, cu. yd.	Time in minutes			No. trips per hour
	Previous time	Loading	Total	
6	16.2	3.12	19.32	2.59
10	16.8	4.21	21.01	2.38
15	17.4	6.98	24.38	2.05

TABLE 10.

Average Cycle Time in Seconds for a 2½-yd. Shovel

Item	Nominal size of truck, cu. yd.		
	6	10	15
8. Load dipper	10.6	10.6	10.6
2. Swing to dump	5.4	5.4	5.4
3. Dump	2.5	2.5	2.5
4. Return	4.9	4.9	4.9
5. No delay time	23.4	23.4	23.4
6. Minor delays	14.6	10.3	9.8
7. Cycle time	38.0	33.7	33.2
8. Cycle time in minutes	0.64	0.56	0.55

Table 7 gives the number of trucks required to haul the earth excavated by the shovel.

Table 8 gives the cost per hour for the shovel and trucks, and the cost per cubic yard for excavating and hauling the earth for each size truck considered. While the cost of

(Continued on page 82)

TABLE 7.

Number of Trucks Required to Haul Earth

Size, cu. yd.	Volume per hour, cu. yd.	Capacity of shovel, cu. yd. per hr.	No. trucks required	No. trucks used	Output, cu. yd. pr. hr.
6	15.0	120.0	8.0	8	120.0
10	20.8	124.2	5.98	6	124.2
15	30.4	129.0	4.24	4	122.2

TABLE 8.

Cost per Hour and per Cubic Yard to Load and Haul Earth by Truck Size

Size, cu. yd.	Production per hr. cu. yd.	No. trucks used	Cost of trucks	Cost of shovel	Total cost	Cost per cu. yd.
6	120.0	8	$48.40	$16.65	$65.05	$0.542
10	124.2	6	52.50	16.65	69.15	0.556
15	122.2	4	53.00	16.65	69.65	0.569

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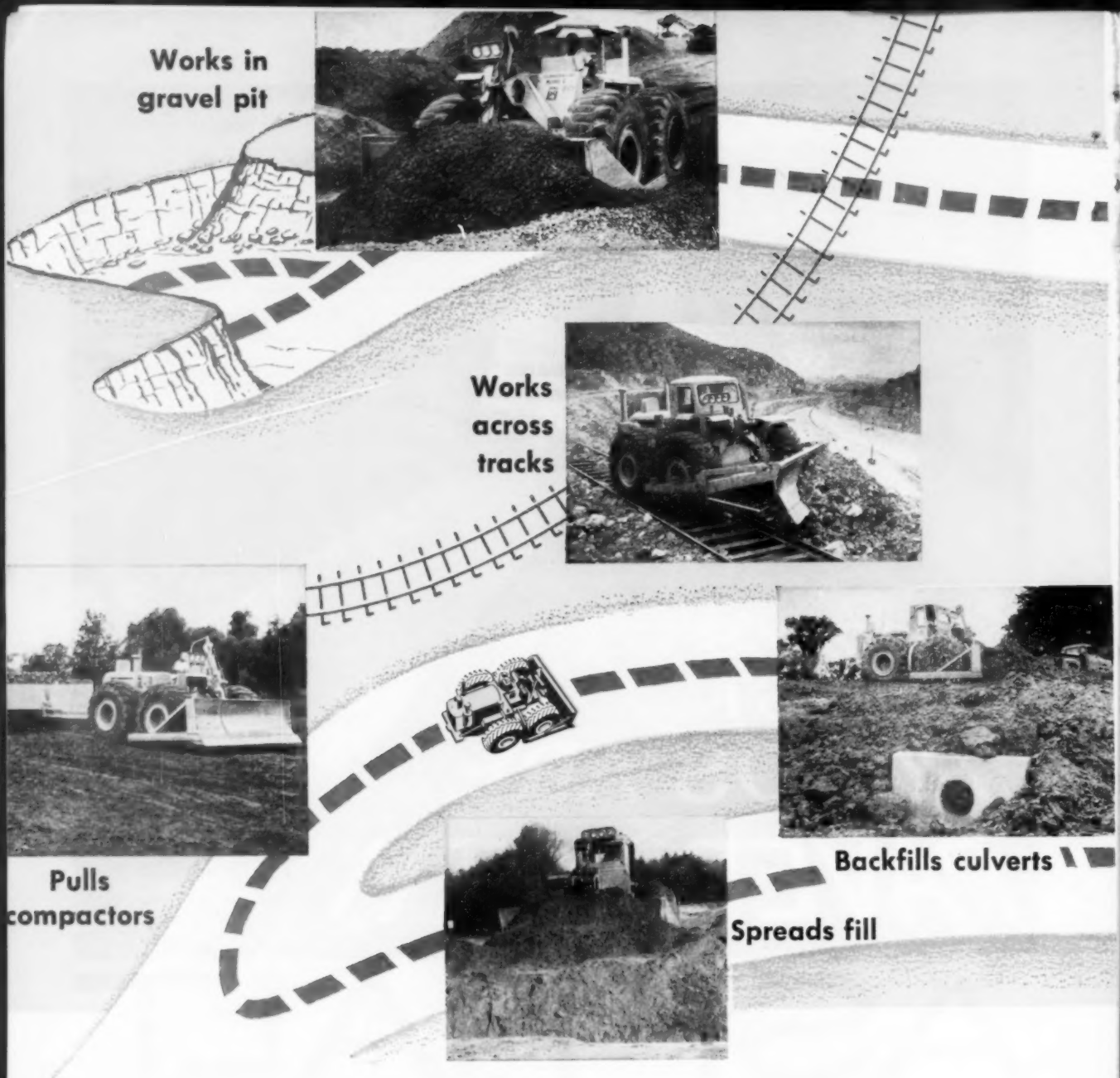

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TABLE 12.

Time Required to Load Each Size Truck

Size, cu. yd.	Maximum volume, cu. yd.	Volume per dipper, cu. yd.	No. dippers required	Time per dipper, min.	Loading time, min.
6	5.78	1.94	2.98 (3)*	0.64	1.92
10	9.27	1.94	4.78 (5)*	0.56	2.80
15	14.84	1.94	7.65 (8)*	0.55	4.40

*The number in the parenthesis in table 12 indicates the number of dipper loads deposited in the trucks.

RIGHT TRUCK SIZE

(Continued from page 78)

the shovel is constant, the variation in the rate of production by the shovel for different sizes of trucks makes it desirable to include the cost of the shovel.

If the production rate of the shovel were constant regardless of the size of trucks used, which usually is not the case, the cost of the shovel could be disregarded for comparative purposes, and the cost of hauling only would enable one to select the most economical size truck. The information in the table indicates that the 6-cu.-yd.-trucks should be used unless there are other factors which should be considered. Also, as indicated in Table 9, the use of the 6-cu.-yd. trucks will require a smaller investment in hauling equipment than for either of the other two sizes.

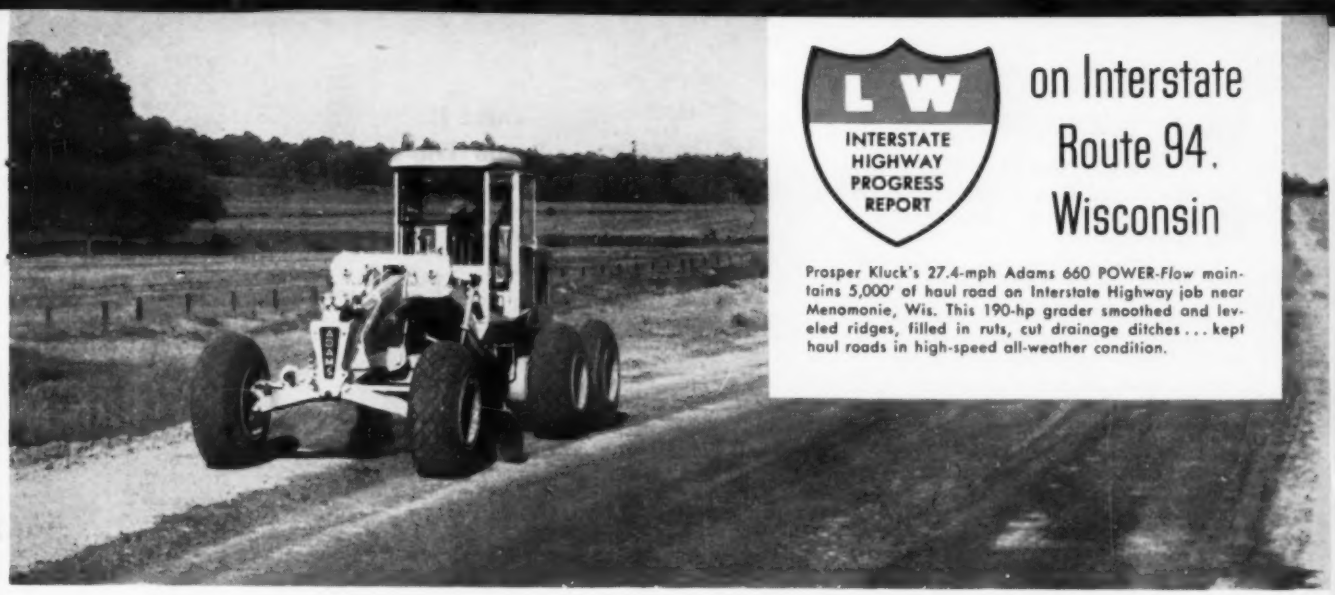
TABLE 11.

Average Production Rates, 2½-yd. Shovel

Size truck, cu. yd.	Number of cycles Per min.	Per hr.	Production, cu. yd. Per min.	Per hr.
6	1.56	93.6	3.03	181.7
10	1.79	107.5	3.47	209.0
15	1.82	109.1	3.53	212.0

Analysis of Performance and Cost When Using a 2½-cu.-yd. Shovel. If the job conditions and hauling equipment remain the same as for the previous analysis, and only the size of the shovel is increased to 2½ cu. yd., the results will be as given in Tables 10 to 17, inclusive. It will be noted in Table 10 that the average time lost because of minor delays for the 6-yd. truck is relatively higher than for the other two sizes, owing to delays because of the small target for dumping the load

(Continued on page 84)



LW INTERSTATE HIGHWAY PROGRESS REPORT

on Interstate Route 94, Wisconsin

Prosper Kluck's 27.4-mph Adams 660 POWER-*Flow* maintains 5,000' of haul road on Interstate Highway job near Menomonie, Wis. This 190-hp grader smoothed and leveled ridges, filled in ruts, cut drainage ditches . . . kept haul roads in high-speed all-weather condition.

The better the haul road . . . the bigger your yardage!

Here's how Prosper Kluck used one big LW POWER-*FLOW*® 660 grader to level network of mile-long haul roads on Wisconsin job

On any of today's big-volume Interstate Highway jobs, you're likely to run into the same problem Prosper Kluck of Stevens Point, Wis., did on the building of 2.5 mi of route 94 near Menomonie, Wis. With 800,000 cu yd of sand and sand-rock to move, Kluck naturally chose big, heavy, high-production scrapers . . . 8 of them. But scrapers this size knock the "speed" out of a haul road in a hurry, and with haul distances of up to 5,000', Kluck needed something special in the way of road-maintenance equipment.

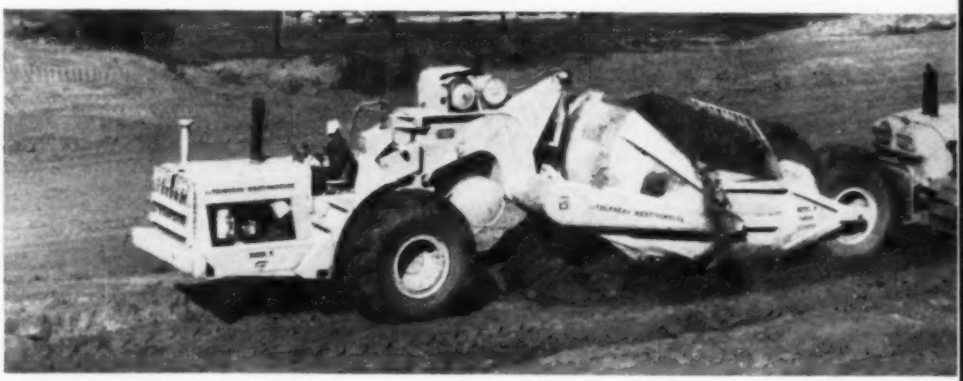
His choice: an LW Adams* POWER-*Flow* Model 660 grader. And this choice was a good one! Not only did the 190-hp machine keep Kluck's network of haul routes in top speed condition, it also maintained the fill . . . where the fast-hauling scrapers dumped approximately 500 yards of material per hour!

"Doesn't give us much downtime"

"That torque-converter '660' is a dandy," says Kluck. "It's big and heavy, and doesn't give us much downtime." The job superintendent adds, "The '660' really gets in there and digs when the going is tough. What's more, this big grader can lay down a mighty fine grade."

Let us demonstrate a LeTourneau-Westinghouse Adams Model 660 POWER-*Flow* grader on *your* job. See how it can speed up production haulers and grader work. Ask us anytime. No obligation.

*Trademark G-2060-DCJ-1



This B Tournapull® with 28-yd Fullpak® is one of 3 used by Prosper Kluck on the Interstate Highway job. Fullpak loads *fast*, as bowl is angled at only 1° when loading . . . lets this tough-loading sand flow in almost horizontally.

. . . for more details circle 341 on enclosed return postal card

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

RIGHT TRUCK SIZE

(Continued from page 82)

into this truck. This is one of the disadvantages of using small trucks with large shovels.

A comparison of the costs of loading and hauling earth, as determined in Tables 8 and 16, disclose that it is more economical to use 6-cu.-yd. trucks with the 1½-cu.-yd. shovel, while the use of the 10-cu.-yd. trucks is more economical with the 2½-cu.-yd. shovel. Table 16 further reveals that either the 10 or 15-yd. size is more economical than the 6-yd. size for the larger shovel.

The use of the 10-yd. trucks, instead of the 6-yd. with the 2½-yd. shovel will result in a saving of $0.03 per cubic yard for loading and hauling the earth, which is a saving of 6 percent. This may mean the difference between a profit or a loss for a project.

An example which will illustrate the relationship between the size of a loading unit and the size of trucks used on a project is to assume that two men, each handling one cubic yard of earth per hour for a total volume of two cubic yards per hour, load a 10-yd. truck. It will require five hours to load the truck. If the cost of the truck only, without a driver, is considered to be $6.50 per hour, the total cost of the idle truck during the loading operation will be $32.50. This represents a truck cost of $3.25 per cubic yard for the earth loaded into the truck. While the example represents unrealistic exaggerated conditions, it does illustrate the cost effect of using excessively large trucks with low production excavators.

Thus, there is a relationship between the size of trucks and the output of an excavator which will produce the lowest cost for excavating and hauling earth.

TABLE 13.

Total Time per Round Trip and Number of Trips per Truck per Hour

Size, cu. yd.	Time in minutes			No. trips per hour
	Previous time	Loading	Total	
6	16.2	1.92	18.12	2.76
10	16.8	2.80	19.60	2.55
15	17.4	4.40	21.80	2.29

TABLE 14.

Volume of Earth Hauled per Truck per Hour

Size, cu. yd.	Volume per load, cu. yd.	No. trips per hour	Volume per hour, cu. yd.
6	5.78	2.76	15.94
10	9.27	2.55	23.60
15	14.84	2.29	34.00

TABLE 17.

The Required Investment in Trucks

Size, cu. yd.	No. trucks required	Cost per truck	Total investment
6	11	$11,000	$121,000
6	12	11,000	132,000
10	9	23,000	207,000
15	6	33,700	202,200
15	7	33,700	235,900

TABLE 15.

Number of Trucks Required to Haul Earth

Size, cu. yd.	Volume per hour, cu. yd.	Capacity of shovel, cu. yd. per. hr.	No. trucks required	No. trucks used	Output, cu. yd. per hr.
6	15.94	181.7	11.40	11 or 12	175.5 or 181.7
10	23.60	209.0	8.85	9	209.0
15	34.00	212.0	6.25	6 or 7	204.0 or 212.0

TABLE 16.

The Cost per Hour and per Cubic Yard to Load and Haul Earth by Truck Size

Size, cu. yd.	Production per hr, cu. yd.	No. trucks used	Cost of trucks	Cost of shovel	Total cost	Cost per cu. yd.
6	175.5	11	$66.55	$27.65	$ 94.20	$0.537
6	181.7	12	72.60	27.65	100.25	0.552
10	209.0	9	78.75	27.65	106.40	0.508
15	204.0	6	79.50	27.65	107.15	0.526
15	212.0	7	92.75	27.65	120.40	0.568

Top money-maker on big-volume jobs — that's the 360-hp B Tournapull with 28-yd Fullpak scraper. Weight tests taken throughout the country prove the "Big B" hauls more of its rated capacity than any other competitive scraper.

They're buying the BIG ones!

NOW, as never before, contractors are up-grading their earthmoving fleets with *big* high-speed self-propelled scrapers. And no wonder — with the demand for faster completion of highways — there are *more* big-yardage, *big-profit* jobs available.

And the LeTourneau-Westinghouse 360-hp B Tournapull® with 28-yd Fullpak® scraper is the machine that gives contractors more of everything they want . . . excellent production, dependability, maneuverability . . . ease of operation . . . and low-maintenance costs.

The Big B 'Pull* gives you all these money-making benefits because it has more high-speed dirtmoving features than any competitive unit. You get, for example, the world's fastest-loading scraper . . . the *Fullpak*. There's the LW *power-transfer differential* . . . which keeps your machine working in softest going. You get exclusive *electric controls* . . . fast-acting, easiest of all control systems to maintain. And you have a *choice of transmissions* — step gear or power shift — to match the machine to your type of work.

Visit your nearby LeTourneau-Westinghouse Distributor . . . let him give you detailed specifications on the LW "Big B". Tell him you'd like to see it in action. Call on him soon!

Another train load of B 'Pulls rolls out of the LW plant at Peoria, Ill. These 8 "B's" will put their owner — C. P. Minnaert, of Cuba City, Wisconsin — in a top competitive position on big-yardage work. The contractor who owns modern, high-production equipment is in position to complete more work on time, and make bigger profits.

*Trademark BP-2127-DC-1

. . . for more details circle 342 on enclosed return postal card

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

IT WAS LAID AT 102 FPM
on a Morrison-Knudsen job in Wyoming

Ask the Morrison-Knudsen crew about the mat they laid on U.S. 30 near Wamsutter, Wyoming. *Outstanding* is the word for it . . . perfect in uniformity, density and smoothness.

While you're at it, ask them about the over-all performance of the Cedarapids Paver that laid this perfect mat at laydown speeds up to 102 feet per minute. Once again, the word is *outstanding!*

And that's the word you'll find all over the country describing the Cedarapids Bituminous Paver. No need to make a trip to Wyoming! Just ask Cedarapids Paver owners in your State (your Dealer will give you their names) about the speed, mat perfection, and inspector-acceptance this advanced-design Cedarapids machine will bring to your job.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U.S.A.

. . for more details circle 334 on enclosed return postal card

Cedarapids — Built by IOWA

BITUMINOUS PAVERS

GIVE YOU ALL THESE OTHER BENEFITS, TOO

High capacity— Paver easily handles 200 tons per hour—keeps your hot-mix plant going full blast.

Maximum density— 3600 screed vibrations per minute assure maximum density at any paving speed. Rapid vibration "irons" the mat into uniform textured, smooth, dense surface, without tears or voids.

Automatic material-depth control— prevents voids—relieves operator from constant attention to depth of material in front of screed

Less maintenance required— efficient electrical controls and drives eliminate many troublesome wearing parts.

Easiest operation— Simple finger-tip controls on one panel—no confusing, fatiguing forest of levers and pedals—operator can concentrate on laying perfect mat!

Unique crawler action and oscillating track rollers permit paving over obstructions—manhole covers and uneven spots in the grade—with screed maintaining a level plane.

Iowa Begins Research in Maintenance Work Efficiency

Highway maintenance is a somewhat neglected subject these days as news of new construction, design and traffic grab the headlines. Behind-the-scenes, however, the engineers in charge of maintenance are finding their responsibilities on the increase. In fact, although the new Interstate highways promise to relieve traffic on existing roads, maintenance chiefs view their completion with mixed feelings. Reports given at AASHO meetings remind that maintenance of freeways must begin literally on the day they are opened to traffic. Design features and high-speed traffic on the big roads pose new problems for the maintenance crews. To keep ahead on both their network of old roads and the new ones, maintenance engineers are realizing their operations must be considerably streamlined, and production per-man substantially increased.

Here and there one sees scattered attempts to reorganize for this workload, to tighten up and to develop a more "scientific" attitude toward what has been traditionally a loose operation.

The most notable move in this direction recently has been launched without fanfare in Iowa. Under a new research project sponsored by the Iowa State Highway Commission and the Bureau of Public Roads, a team of research engineers will spend a year appraising highway maintenance operations "with a stop watch." Their objectives:

- To determine what kind of maintenance and how much (in terms of actual man-hours and equipment-hours) is required on typical primary roads over a one-year period.
- To determine how performance of repair forces is affected by crew size, type of equipment, terrain, and roadway design.
- To break maintenance operations down into specific performance units (acres of roadside mowing, square yards of re-surfacing) that will permit wiser management control and budget allocation.
- To recommend ways in which original design can reduce the maintenance requirements.

Preventive Maintenance, Ultimate Goal. M. J. Kilpatrick, production specialist for the U. S. Bureau of Public Roads, pointed out in Washington last week that a tremendous challenge to the engineering profession lies in the latter area—that of "preventive maintenance." He defined some of goals of designers and researchers for making the future maintenance chore easier and more economical:

- Improving methods or materials for delineating pavement and curbs and thus eliminate the necessity for painting.
- Designing drainage structures with more effective self-cleaning features.
- Improving guardrails and posts in some way to eliminate painting and to permit rapid mowing of shoulders more completely by mechanical rather than manual methods.
- Improving cross-sections on divided highways so as to prevent motorists from indiscriminately crossing medians and producing ruts.
- Improving the design of drainage ditches to reduce erosion.
- By improving expansion devices for bridges that would eliminate collection of dirt and debris.
- Improving pavement surfaces to retain their skid-resistant qualities for a longer time.
- Improving road cover to reduce or eliminate the need for mowing.

In its study of maintenance operations, the Iowa research team will be extremely observant, particularly of delays and lost time by the work crews and their equipment. The human factor in maintenance produces far more lost time than is generally realized, engineers believe, and a scientific evaluation of this aspect alone may stimulate a new interest in mechanization.

● **Two trucks with plows and chemicals head out. Alerted by weather information, the operators start applying salt and calcium-chloride mixture before bad conditions develop. (Right): Twenty minutes later, after the application, the freezing rain and snow have turned to light slush. Soon this pavement will be bare and dry under traffic. Temperature here, 20° F.**

"We Begin Our Winter Maintenance Battle in Summer"

Advance planning is one reason why the Ohio Turnpike has never shut down for a single day despite its location in a notorious snow and sleet belt.

By Duane L. Cronk
Director, Highway Information Services, Inc., Washington, D.C.

Veteran highway maintenance engineers may be inclined to smile at the suggestion that anyone might transform their perpetual struggle against snow and ice into a "scientific" operation. But in northern Ohio, a band of engineers, who haven't been told yet that "it can't be done," are writing some new rules on winter maintenance.

Their field of operations is the Ohio Turnpike, a dynamic link in the nation's Interstate System, on the main route from New York City to Chicago. This 241-mile-long toll road funnels traffic from the Pennsylvania Turnpike and the New York Thruway to the Indiana Turnpike.

The big road lies in the path of winter storms which sweep 50 to 60 times a year across the Midwest under the Great Lakes. It is an easy victim of heavy snows, sleet, and rain, which suddenly freezes turning the pavement into a mirror of ice.

Thanks to one of the most thoroughly preplanned and highly organized of highway maintenance efforts, however, the long road has never been shut down. In fact, during the nearly five years since its completion, the Ohio Turnpike has won a reputation among motorists and transcontinental truckers—for speed and safety—when other northern roads were often choked with snow or slick with ice.

In February of this year we visited the Turnpike Commission's Berea, Ohio, headquarters. On that February day, with snow drifting across the pave-

● **One of the Ohio Turnpike Commission's 5-ton Oshkosh trucks, loaded with chemicals, plows the shoulder along its prescribed section of the 241-mile Ohio turnpike.**

ment and the department's border-to-border radio system crackling with terse reports of bad weather, Maintenance Engineer L. G. Byrd and his division chiefs were calmly planning—of all things—their roadside mowing procedures for a period six months away. Therein lies the secret of success in the toll road's struggle against the weather.

This 1958-59 winter's maintenance program was written in July, 1958, and the coming winter's strategy is already spelled out.

"If you want to fight Old Man Winter in the wintertime—on his grounds and his terms—go ahead," the Ohio engineers say. "That's the usual story of winter road maintenance—a succession of emergencies—clogged roads, stalled equipment and irate motorists. We choose to start fighting him in the summertime."

Advance planning is a major tactic in the Turnpike's winter maintenance campaign. There are other elements worth noting, including:

- A top-notch organization of capable men, with the imagination and aggressiveness sometimes lacking in maintenance departments.
- A well-established plan of attack, for every foreseeable pavement condition.
- An equipment fleet large enough to handle storm situations.
- A chemical ice-control program utilizing some original ideas, including an individualized salt-calcium chloride mixture.

● *A Dollars-and-Cents Proposition.* All of these aggressive measures to keep the Pike clear of ice and snow are justified by a dollars-and-cents incentive. Ice and snow control will cost the Commission $450,000 this year, but the investment is a sound one.

More than 11 million vehicles rolled over the four-lane divided highway in 1958; their drivers dumped $20.8 million in tolls. A healthy 17 percent of the revenue comes in during the normally low winter months, December, January and February. Officials believe that the big reason revenues have held up through the winter is the aggressive, "scientific" maintenance program which kept pavements bare and traffic rolling every day, every hour.

"We make big money on days when parallel roads are impassable," a Turnpike official said. "People turn toward the turnpike when the weather starts acting up. Bare pavement is our WELCOME mat."

This businesslike approach has pinned heavy responsibility on the Pike's maintenance department, which is, in many ways, a "model" setup. In spite of the length of the road—241 miles of dual lane (plus another 45 miles of ramps at 15 interchanges) and 16 service areas—the organization is small: only about 190 men and women including office personnel. But it is tightly organized to permit quick mobilization of men and equipment.

● Prime burden for the maintenance program rests with Gary Byrd who, in turn, reports directly to Deputy Executive Director Russell S. Deetz. His right-hand man is Wesley Hottenstein, assistant maintenance engineer. Traffic engineer Benjamin Bowman works closely with the maintenance force on numerous engineering aspects.

The road is divided into two divisions, the Eastern half headed by Division Chief Wallace Allison, the Western half by Francis Staib. Division chiefs are headquartered in their own offices with complete maintenance and machine shops—each about 121′ x 152′.

Each division is divided, in turn, into four sections, under the direction of section foreman. Section headquarters are spread out to handle about 30 miles each, with offices and shops for repairing equipment and storing materials and parts. Each section has its own complement of men and machines and a roster of reserve forces within its area to help it handle extremely heavy storms.

1959 Maintenance Budget for 241-Mile Ohio Turnpike

Maintenance Engineer and Headquarters Staff
Salary cost of the maintenance engineer, asst. maintenance engineer, equipment supt., building supt., master mechanic, draftsman, 4 secretaries and clerk typist is $66,000, and other costs include travel $2,000 ..... $ 68,000

Division Superintendent and Staff
Salary cost of the two division supts., 2 administrative assistants, 2 shop foremen, 2 store clerks and 2 asst. store clerks is $52,000. Labor, miscellaneous $6,000; small tools $5,800; vacation for division hourly personnel $6,000; sick pay allowance, division hourly personnel $3,000; and miscellaneous $200 73,000

Section Foremen and Staff
Salary cost of 8 foremen and 8 clerks is $81,600. Other costs include labor miscellaneous $96,000; small tools $7,000; telephone and telegraph $4,000; heat, light and water $36,000, and miscellaneous $400 225,000

Snow and Ice Control
Material costs are estimated to be $360,000 which included sodium chloride, calcium chloride and abrasives. Material handling $8,000; application $80,000; and snow fence $2,000 450,000

Pavement
This includes cost for resealing joints and cracks $40,000; jacking and subsealing $28,000, repairs $16,000 (exclusive of Exits 13 and 11 and MP 15.6); and cleaning $18,000 102,000

General Equipment
This includes cost for maintenance and operation of passenger vehicles and miscellaneous equipment for which we have only one item $10,000 and purchase of new and replacement equipment $2,000 12,000

Division and Section Equipment
This includes cost for maintenance and operation of all vehicular and special purpose equipment 250,000

Median Strips and Shoulders
Includes costs for shoulder maintenance and repair $12,000; landscaping (turf maintenance, scalping and planting Westgate) $24,000, crossover road maintenance $5,000, mowing and trimming of grass (including chemical treatment full length of guard rail and weed control full length of turnpike) $62,000, and cleaning $18,000. 121,000

Drainage
Repairs and cleaning of drains and gutters, and repairs of slopes and ditches $30,000..... 30,000

Bridges and Culverts
Includes cost of bridge maintenance $56,000; and culvert maintenance $4,000 60,000

Fences and Guard Rail
Cost for repairing and replacing guard rail $48,000 and repairing and replacing right-of-way fence $2,000 50,000

Maintenance (8) Building and Facilities
Includes maintenance and repair of maintenance buildings $24,000; grounds and access roads $5,000 and landscaping $4,000 33,000

Miscellaneous
Small tools and supplies $8,000; vacation allowance for section hourly workers $28,000; and sick pay allowance for section hourly workers $16,000 52,000

Service Plazas
Building maintenance $15,000; water system $1,000; sewage systems $5,000; outside lighting $45,000; access road maintenance $11,000; pavement and walks $4,000; landscaping $10,000; and miscellaneous $3,000 94,000

TOTAL $1,620,000

● **Inside one of the OTC's section shops—room for maintenance equipment, as well as offices, machine shops, supplies and tools. Shown here: a Pitman "Giraffe" on a White 3000 truck; 2-ton Ford (F-600) with Good Roads body; a Kelly-Creswell paint striper on a White 3000; and one of the Commission's 5-ton Oshkosh trucks.**

Although most winter storms move from West to East across the Pike, hitting a section at a time, there are occasions when weather swoops down from Lake Erie, just a few miles to the North, and blankets the entire facility. So each section is equipped and manned to handle most of its own problems.

A section labor pool consists of 18 men, plus foreman, divided into two crews. During particularly heavy storms necessitating around-the-clock vigilance, a section may supplement its forces by calling in nearby contractors and paying them at pre-arranged rates for their manpower and equipment.

The Ohio engineers depend heavily upon their equipment fleet to get them through winter emergencies. It pays to purchase good equipment and to keep it in top-notch condition, they believe.

Then, when it's needed, it's ready to go.

● *Big Equipment Fleet.* What kind of a rolling equipment does it take to keep a 241-mile highway clean?

Here are just a few of the major items required for snow removal and ice control in *each* of the Pike's eight 30-mile sections:

- To all-wheel-drive, 5-ton trucks with front and wing plows, hydraulically operated underbody blades, and hopper bodies with spinner disks.
- Six 2-ton trucks equipped with snow plow and interchangeable dump and hopper bodies, the latter having hydraulically operated bottom belt conveyor and spinner spreader.
- One motor grader equipped with V-plow.
- Two front-end loaders for loading chemicals and abrasives.

In a state-wide storm across the Turnpike, maintenance engineers can turn out 48 two-ton trucks and 16 five-ton trucks to plow and spread abrasives and chemicals, augmented by eight large motor graders plowing and scraping ice.

A border-to-border RCA radio system along the road enables maintenance engineers to keep in communication with their scattered forces. The complete network, utilizing five separate channels, interconnects the main Commission office with section and division headquarters, shops, service trucks, police cars, and other pieces of equipment. The engineers can direct 138 vehicles via the air waves, enabling them not only to direct automobiles and trucks to trouble spots, but also to receive immediate information about conditions all across the state.

Up-to-the-minute weather reports are filtered into Turnpike headquarters over a direct teletype line from the U.S. Weather Bureau at Cleveland's Hopkins Airport. In turn, the main office relays weather forecasts at least five times daily to its outlying divisions and section offices. The whole work force is kept constantly alert to weather conditions.

The communications system is, of course, a two-way avenue. When a storm rolls onto the Pike and as it progresses, each section keeps headquarters aware of roadway and weather conditions in its area. This information is continuously plotted and the whole picture dissemi-

(Continued on page 93)

On 1¼ million yard highway job:

3-yard Manitowoc heaps haul units at rate of 160 loads each 8½-hr. shift

An important segment of the Interstate Highway program is now under construction 20 miles Southwest of St. Louis. Here Fred Weber Contractor, Inc. of St. Louis has the contract for approximately nine miles of new Interstate 44.

One section of the 1¼ million yard job is shown here — a 35,000 yard cut paralleling U. S. Route 66. Weber is using a 3-yd. Manitowoc Model 3600 shovel on this cut. An average of 160 heaped haul units are loaded each 8½ hour day. The hauling fleet, six 25-yd. and two 18-yd. units, has a long 12,000 ft. one-way haul, stopping traffic to high-ball across Route 66.

"Easy as pie" operation

On the same job Weber also has another 3-yd. Manitowoc shovel, a 25-ton Manitowoc Crane driving 50-ft. piles 45-ft. deep, and a 2½-yd. shovel working in a nearby quarry. When interviewed at the job site, Superintendent John R. Weber said, "We're getting very good production from the model 3600. It gives us more output with less maintenance." And the shovel operator, F. C. Warneke noted, "It's easy on the operator because air control makes it easy as pie."

Bonus Output Features

The Manitowoc 3600 gives you air controls, torque converter drive, disc-type clutches, and removable counterweight as *standard* features . . . provides equally great performance as a trench hoe, crane, dragline or clamshell. Analyze your upcoming bids now . . . see how the 3-yd. 3600 can help your profit picture. Your Manitowoc distributor will gladly fill you in on all the facts.

Manitowoc

MANITOWOC ENGINEERING CORP.

(A subsidiary of The Manitowoc Company, Inc.)

MANITOWOC, WISCONSIN

CRANES	SHOVELS	DRAGLINES	TRENCH HOES
25 TON - 100 TON	1¼-YD. - 5½-YD.	1¼-YD. - 6-YD.	1¼-YD. - 3-YD.

. . . for more details circle 350 on enclosed return postal card

Equipment Rental Rates Ohio Turnpike Maintenance

(When help is needed for peak operation)

$ 2.50	Truck, Ford and Chevrolet (2-ton) dump
2.50	Truck, Stake body (IHC) 2-ton
4.25	Truck, Chevrolet w/plow and tailgate spreader
5.00	Truck, Ford w/snow plow and hopper
7.00	Truck, Oshkosh or Marmon-Herrington w/plow and hopper
1.70	Sweeper, towed (Littleford)
3.50	Sweeper, self-propelled (Wayne)
5.00	Grader (Galion)
7.50	Grader, w/snow plow
4.00	Loaders, front-end (Hough and Tractomotive)
1.80	Roller, tandem, 5-ton
2.00	Welder, electric, portable, engine-driven, trailer-mounted
1.75	Tar kettle, trailer-mounted
1.00	Sewer cleaner, powered, trailer-mounted
1.00	Power plant, portable, gasoline engine driven, 5 KW
3.00	Power plant, portable, gasoline engine driven, 15 KW, trailer mounted
.75	Retriever, safety cone (Kelly-Creswell)
.75	Sealers, pavement cracks (Lincoln)
.40	Mower, powered, scythette (hand-carried
.60	Mower, rotary type, lawn mower (Cooper)
.60	Mower, sickle-bar type (National)
1.00	Spreader, paving materials, towed (Flink Even-Seal)
1.00	Tractor, garden type (Gravely)
3.00	Tractor w/Sickle bar mower (Worthington)
2.00	Tractor (IHC 300)
2.25	Tractor (IHC) w/snow plow
3.25	Tractor (IHC) w/post-hole digger
3.50	Tractor, IHC w/backhoe
3.50	Seeder, Finn (Hydro-seeder)
3.50	Mulch spreader (Finn)
.50	Klodbuster (Finn)
1.00	Tamp, mechanical, gasoline engine driven (Barco)
3.00	Saw, concrete (Clipper)
2.00	Compressor, air, portable 100 cfm, trailer mounted (all makes)
1.75	Mud jack
1.00	Cement mixer, portable, gasoline engine driven
2.00	Paint striping machine, small, self-propelled
7.00	Paint striping machine, truck-mounted
2.00	Trailer, flatbed, 10-ton
5.50	Distributor, bituminous material, truck-mounted (Littleford)
5.00	Platform aerial, truck-mounted, "Giraffe"
8.50	Excavator, multi-purpose (w/attachments), truck-mounted "Gradall"
120.00	Sedan, (all makes and models)
120.00	Truck, ½ ton and ¾ ton (all types including pick-ups and special bodies, i.e., carpenter, electrician, plumber)
130.00	Station wagon

(Continued from page 91)

nated back for various purposes—to alert commercial radio stations of travel conditions and to warn motorists of dangerous conditions ahead of them.

● *A Plan for Every Situation.* An elaborate, but field-tested plan of attack for every possible foreseeable pavement condition has been written and field-tested by the Ohio organization. It is another indication of the organization's attempts to meet "Old Man Winter" more than half-way.

There are four conditions which turnpike maintenance men watch for, and the standardized procedures they have developed to meet them.

1. If 25° F. or above, and rising; precipitation is snow, sleet or freezing rain; pavement wet.

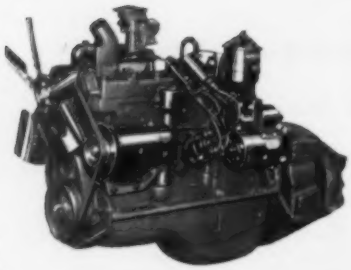
Immediate treatment: For snow or sleet, apply salt at the rate of 400 lb./mile. For freezing rain, apply salt at 200 lb./mile.

Subsequent treatment: If snowfall or sleet continues and accumulates, plow and repeat salting simultaneously. If rain continues to freeze, reapply salt at 200 lb./mile.

When the storm ceases, discontinue application but continue patrolling until pavement is clear and dry.

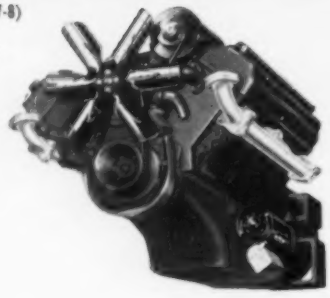
(Continued on page 101)

● Trucks unloading unused portions of chemicals to the outdoor stockpiles. A front-end loader stationed at each section shop re-dresses these piles at the crews' convenience. OTC officials believe this advantage of outdoor stockpiling produces a substantial saving.



IND. 32 (6)
265 cu. in.
displacement

DEMAND for CHRYSLER POWER at all time high!



IND. 56-A (V-8)
354 cu. in.
displacement

Why?

- *More power per cubic inch displacement*
- *Longer engine life*
- *Service and parts available within 8 hours*

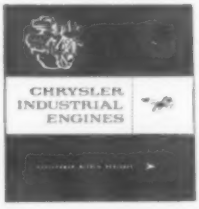
MORE POWER. Chrysler Industrial Engines develop more horsepower per cubic inch displacement than rival engines. Chrysler's famous fluid coupling and torque converter handle extreme load demands with peak efficiency.

LONGER LIFE. Full filtering oil system, special hardened crankshaft and bearing material, superfinished moving parts provide thousands of extra hours of trouble-free operation. Chrysler power is tailored to individual applications through thousands of combinations of options and accessories.

SERVICE. New Chrysler industrial engine centers and dealer network virtually eliminate down time losses. Parts and service available anywhere in the United States within 8 hours. The fastest, most efficient service in the industry.

NOW AVAILABLE FROM CHRYSLER—
DIESEL ENGINES, 9 to 300 h.p. (16 models)

Investigate big output Chrysler Industrial Engines for power in the 230 to 354 cu. in. displacement range. Discover what Chrysler engines can do for your product!



NEW Chrysler Product Line Catalog gives complete details on all engines, all optional equipment. Enables Chrysler sales engineer to "build" and price an engine for your individual application—right at your desk. A call or letter will bring a Chrysler sales engineer to your office.

CHRYSLER

MARINE AND INDUSTRIAL ENGINE DIVISION
CHRYSLER CORPORATION · DETROIT 31, MICHIGAN

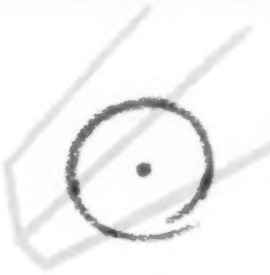
. . . for more details circle 311 on enclosed return postal card

Here are the points to remember...

12M ALLOY STEEL

ESCO 12M Points are the toughest you can buy. Developed through years of research for the construction industry, cast *ESCO* 12M is carefully heat treated to produce the finest steel made for the severe shock and abrasion encountered by points and adapters.

RIGID QUALITY CONTROL TESTS ASSURE TOUGHNESS, HARDNESS



Every *ESCO* Point is Brinell tested to assure the exact degree of shock-absorbing toughness and abrasion-resisting hardness for longer digging life. Be sure to look for the Brinell mark on every *ESCO* Point you buy.

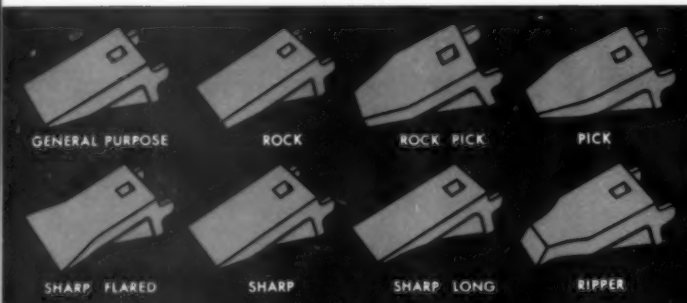
8 POINT SHAPES

You can select from eight different shapes to find the point that matches your digging conditions. *ESCO* Points are designed by bucket and excavation specialists who know how to achieve top digging performance. The self sharpening design of an *ESCO* Point makes it start sharp and stay sharp.

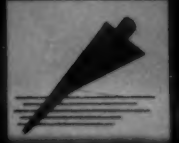
ESCO Points and Adapters for all digging equipment

Your local ESCO dealer can supply Points and Adapters for all your digging needs. By using ESCO Points and Adapters on all your equipment you can cut costs further by reducing your point inventory and consolidating purchases. Call your ESCO dealer today for details. He's listed in the yellow pages of your telephone directory. Or, write direct.

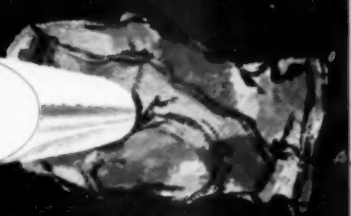
LITHO IN U.S.A.



ESCO Point shapes . . . start sharp, stay sharp and last longer under any digging condition.



ESCO

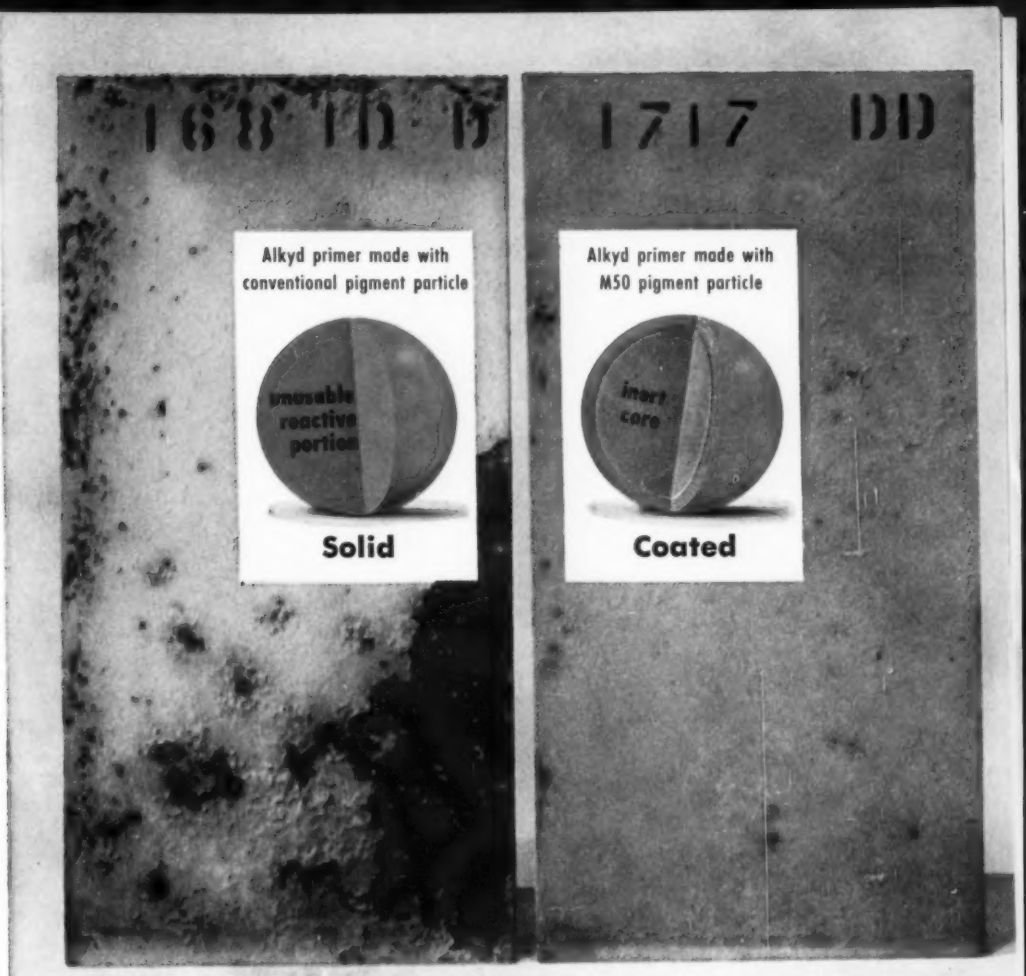


Electric Steel Foundry Company
2155 N. W. 25TH AVE. • PORTLAND 10, OREGON

MFG. PLANTS AT PORTLAND, ORE. AND DANVILLE, ILL.
Offices in Most Principal Cities
ESCO INTERNATIONAL, NEW YORK, N. Y. • IN CANADA ESCO LIMITED

For more facts, turn page

Never before such durable metal protection



Proof M50 pigment Defense in Depth paints deliver up to 300% greater content of rust-inhibitive ingredient

Exposure tests make it plain! Paints containing M50* basic lead silico chromate pigment do more to prevent rust. Look at the panels above. These primers were applied (2.0 mils, dry) over rust and mill scale (to intensify severity of the tests), then exposed 12 months at Perth Amboy, N. J. in an industrial atmosphere and 12 months at Sayville, L. I. in a normal atmosphere at 45° South. Clearly, the rust arresting action of M50 pigment is significant.

Research analysis of tests like this prove an *M50* pigment Defense in Depth paint provides substantially more rust-inhibitive action than comparable paints made with conventional pigments. You can see one reason for this. The configuration of the *M50* pigment particle provides a more efficient way to take advantage of the well-known rust-inhibitive properties of the active ingredients (fused lead chromate).

Second reason for the improved anti-corrosive action of *M50* Defense in Depth paint systems is the versatility of the *M50* pigment. Unlike other rust inhibitors, the inert-core particle is technically desirable and economically practical for use in intermediates and finishes . . . not just in primers alone. *Each* coat in an *M50* pigment system can be given substantial rust-inhibitive properties in its own right. Hence total rust-inhibitive pigment content of some *M50* pigment systems exceeds the rust-inhibitive content of comparable non-*M50* pigment systems by as much as 300%.

See on the next page other ways *M50* pigment Defense in Depth paints step up metal protection. See also how National Lead is prepared to help you get these superior specification products from your regular paint suppliers.

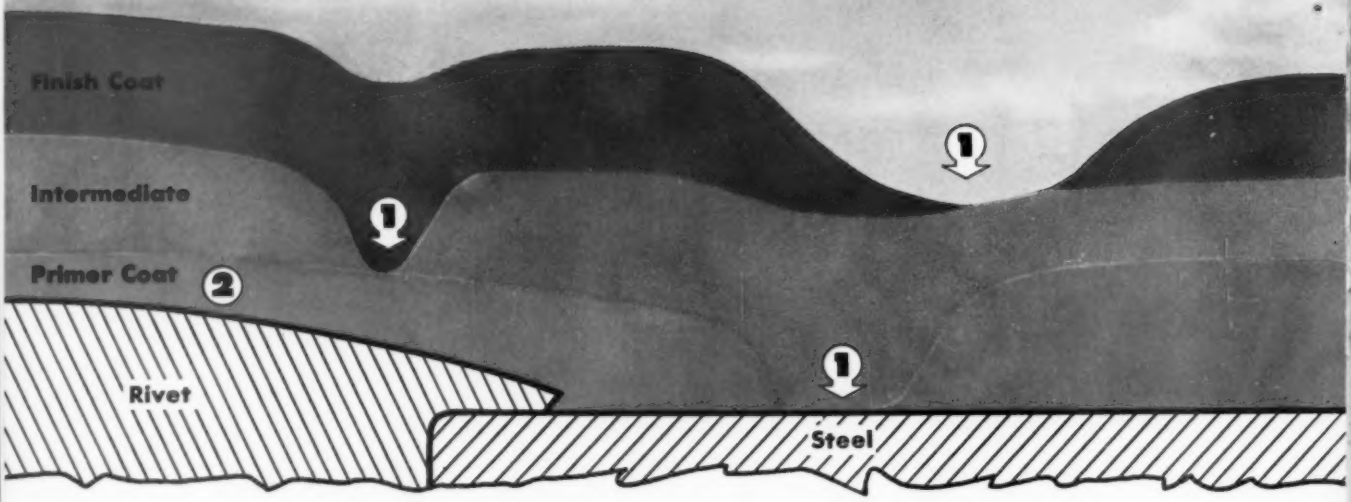
*Registered trademark of **National Lead Company**

General Offices: 111 Broadway, New York 6, N. Y.

For more facts, turn page

(1) "Holidays" in any coat of M50 pigment systems are less harmful . . . all coats provide both rust inhibition and weather resistance.

(2) With M50 pigment Defense in Depth paints, thin deposit areas such as rivet heads, have more protection . . . paints "wet" pits and hollows, too.



Schematic section through 3-coat M50 pigment Defense in Depth system shows new paints provide two performance extras

Information on the preceding page proves that *M50** pigment Defense in Depth paints deliver inherent rust inhibition well beyond that available in other anti-corrosive paint systems.

Diagram above shows two additional performance extras. Because *M50* pigment coats give more protection over thin deposit areas . . . because breaks in *M50* pigment coats traceable to damage or painting mishaps are less harmful . . . the need for on-the-job spot priming and touch-up is greatly reduced. Then, too, *M50* pigment primer coats are not only rust inhibitive but also weather resistant. Re-priming is rarely needed.

Other advantages of *M50* pigment paints include a broad choice of colors in all coats, with excellent tint retention.

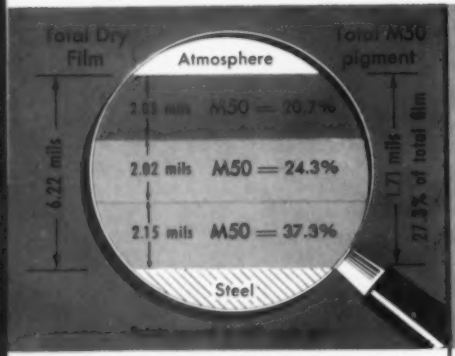
Are you responsible for steel structure maintenance?

If so, you are invited to examine exposure tests of *M50* pigment paints at National Lead's Sayville, L. I. test station. National Lead will also:—(1) send you a 24-page descriptive brochure, "Defense in Depth." (Mail coupon below); (2) provide technical aid in test applications; (3) help you develop suitable specifications for paints containing *M50* pigment.

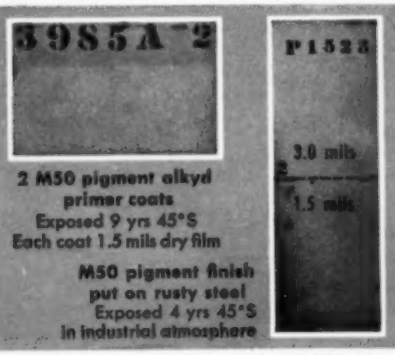
For M50 pigment paints themselves, contact your regular suppliers.

*National Lead Company trademark for a basic lead silico chromate pigment

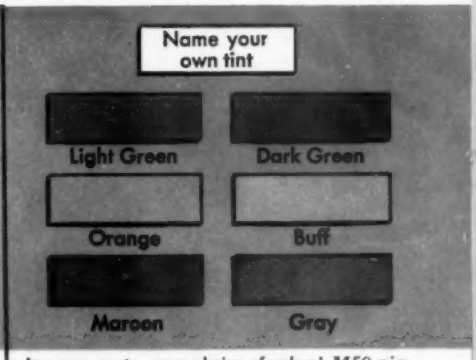
Why M50 Defense in Depth paints give you metal protection beyond all former concepts



In every coat . . . rust inhibition! Fused lead chromate is noted for rust-inhibition. The *M50* pigment particle structure permits paint makers to include large proportions of lead chromate in all coats of anti-corrosive systems.



In every coat . . . weather resistance! *M50* pigment is insoluble in water and has the excellent tint retention properties of fused lead chromate. Unlike other rust inhibitors, it actually boosts weather resistance of paints.



In every coat . . . your choice of colors! *M50* pigment gets along well with most tinting pigments, permits paint makers a wide range of colors . . . not only in intermediates and finishes but in primer coats as well. Colors stay true.

M50 Defense in Depth

National Lead Company,
111 Broadway, New York 6, N. Y.

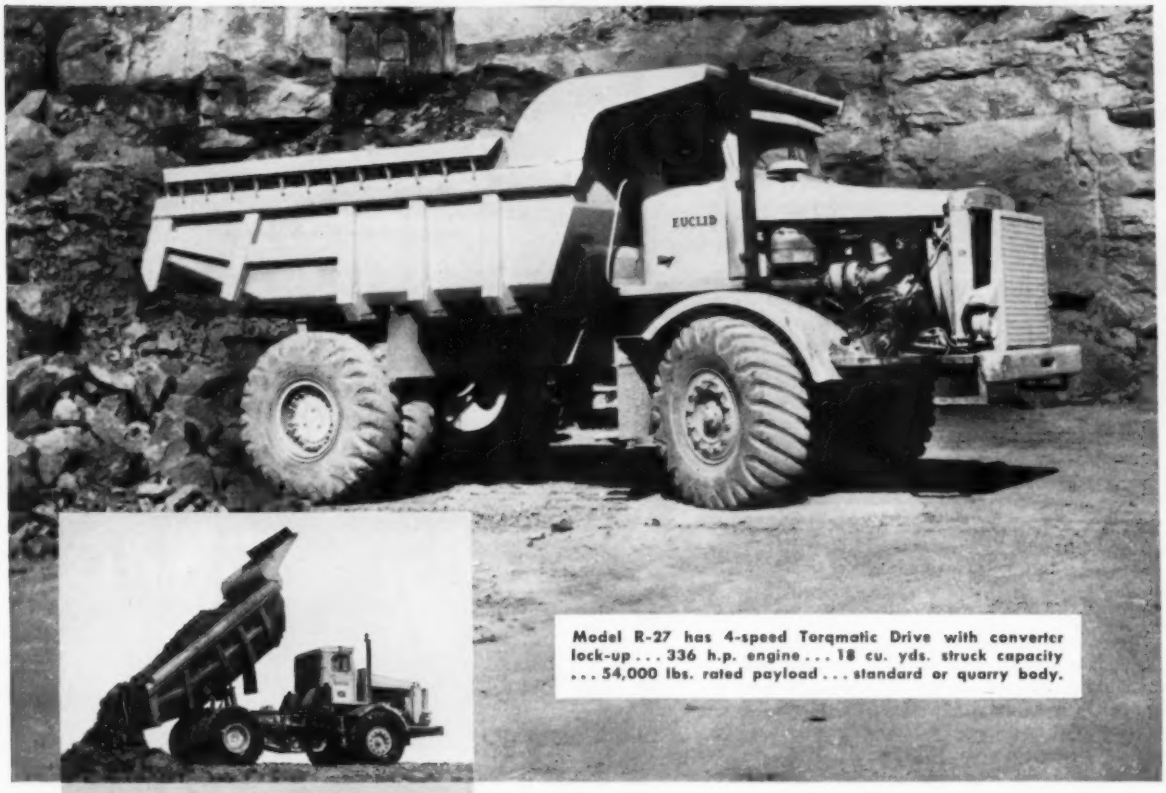
Gentlemen: Please send me your 24-page brochure, "Defense in Depth." Include color card of the six *M50* pigment paints you recommend for steel highway structures.

Name_____ Title_____

Firm or Dept._____

Address_____

City_____ State_____



Model R-27 has 4-speed Torqmatic Drive with converter lock-up . . . 336 h.p. engine . . . 18 cu. yds. struck capacity . . . 54,000 lbs. rated payload . . . standard or quarry body.

Rock Bottom Hauling Costs with Euclid Rear-Dumps

THE simple but rugged design of Rear-Dump "Eucs" has provided cost cutting performance in mines and quarries for over 25 years. This unmatched experience in building dependable off-highway haulers, combined with continuous product improvement and excellent dealer facilities for parts and service, results in high job availability and low maintenance cost.

Euclid's line of rear-dump haulers for mine, quarry and construction work is the most complete in the industry. With standard or quarry bodies, there are models with 10, 15, 18, 22, 27, 40 and 55 ton payload capacities . . . engines from 128 to 670 total h.p. . . . 5 and 10-speed transmissions and Torqmatic Drives. For close quarter work there are three over-hung engine models with semi-trailers of 12, 22 and 35 ton capacities.

Have the Euclid dealer in your area give you complete information on the models that fit your requirements. He can show you how "Eucs" cut hauling costs and bring a better return on your investment.

EUCLID Division of General Motors, Cleveland 17, Ohio

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

. . . for more details circle 322 on enclosed return postal card

NEW-

Tow it into place

... Weir Contracting Co. tows their Heltzel Unitized, Mobilized Batching plant from previous job site on its own transportation wheels...

Heltzel's new 100 and 150-ton, pushbutton batching plants are now *unitized* and *mobilized* for easier moving—for faster setup—for greater savings of time and money.

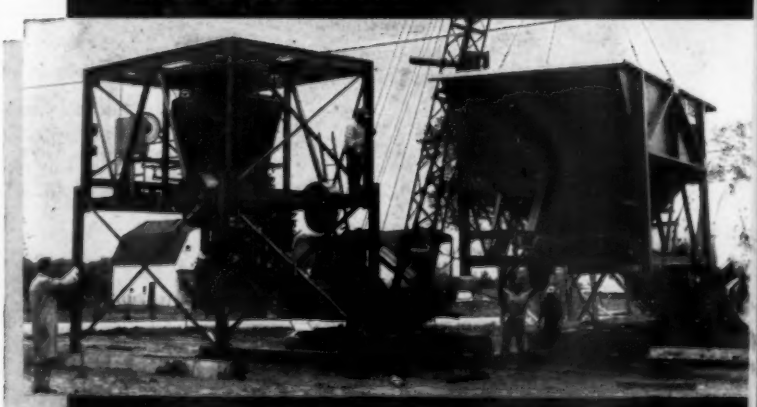
The new plant consists of two self-contained mobile sections; hopper section and batcher section (including scales) with new fold-up supporting columns. Both sections have built-in wheel assemblies and towing tongues—ready to roll.

Weir Contracting Company of Detroit, Michigan reports: "... Our first job was in Greenbrier Meadows Subdivision, Livonia, Michigan. After the plant arrived on the site it was ready for operation in a very few hours. We found that the speed of batching will give two complete batches in thirteen seconds. On subsequent work, the plant was dismantled and ready for transportation in two hours and towed by small, single axle dump trucks to the new location. We have found that the built-in transportation wheels save us over $100.00 a move because of not having to rent trailers."

For complete data and specifications contact your nearby Heltzel representative—or write us direct.

Set it up fast

... batcher section is raised into position, hinged columns are lowered and bolted in place ...

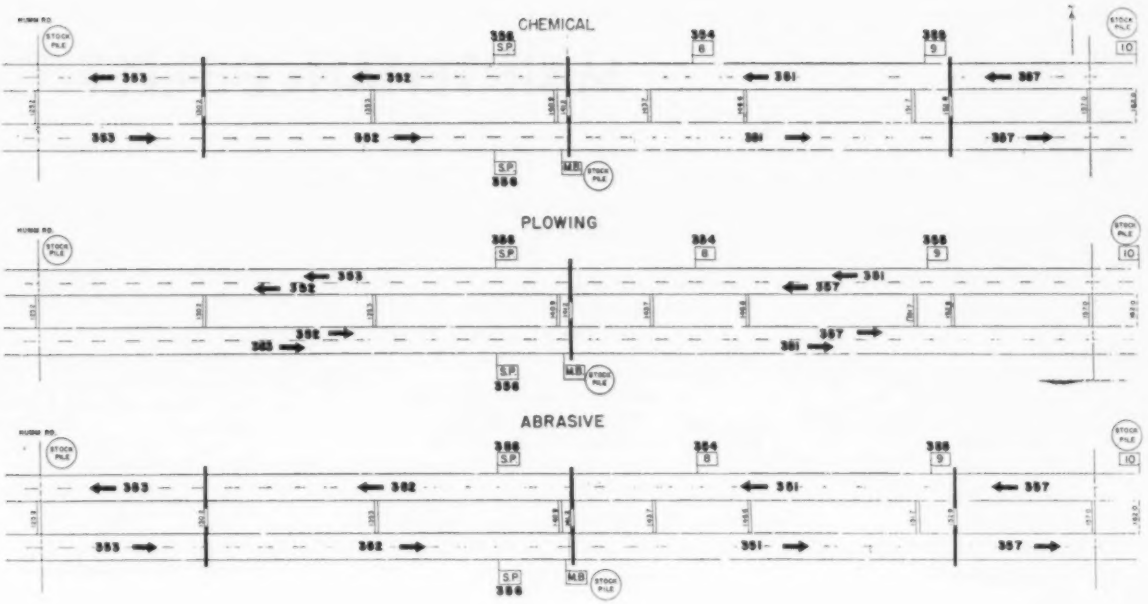


... bin section is positioned and bolted on top of batcher section.

Start batching

In just a few hours this full size, high capacity, pushbutton paving plant is ready to operate!

THE HELTZEL STEEL FORM AND IRON COMPANY
WARREN, OHIO



● **Chart showing how vehicles were actually dispersed over a 27-mile stretch of the Ohio turnpike during a winter storm. Numerals are truck accounting numbers. "SP" is for stockpiles of chemicals. This sheet (not shown here) also gives the equipment carried on each truck: make and model of plow; accounting number of the radio unit installed; body type; names of crewmen assigned.**

Winter Preparation Time Clock

The 1958 schedule to be repeated with only minor modifications in the 1959 Autumn.

September 16	Field Directive revised Equipment assignment charts distributed to sections.
September 23	Snow and ice control charts completed by sections and turned in to maintenance engineer for review.
September 30	Maintenance yards readied for new material deliveries and inspected.
October 2	Foreman's conference (tentatively scheduled at Elmore)
October 1	All radio equipment reinstalled
October 1-17	Snow plow push frames installed on all equipment. Oshkosh trucks fully readied for operation. Two Ford hopper bodies installed in each section.
October 27-31	Field inspection of Western Division equipment. Review of snow and ice control charts. Practice run of section assignments in Western Division.
October 17-Nov. 1	Six hopper bodies installed in each section. Initial salt shipments started.
November 3-7	Field inspection of Eastern Division equipment. Review of snow and ice control charts. Practice run of section assignments in Eastern Division.
November 2	Snow fence proposed locations reported in writing to maintenance engineer. Calcium chloride pads repaired and ready at each maintenance building yard. Initial salt shipments to each section completed. Front-end loaders stationed at intermediate stockpile sites, "hot-starts" installed and ready for operation.
December 1	*All* hopper bodies installed in each section.
December 1-15	Initial calcium chloride shipments to be made.
December 1-31	Snow fence erection to be completed at approved locations.

WINTER MAINTENANCE

(Continued from page 93)

2. If 25° F. or below and falling; dry snow falling; pavement dry.

Immediate treatment: Plow as soon as practical. Do not apply salt or chemical treatment.

Subsequent treatment: Continue to plow and patrol to check for wet, packed or icy spots. Treat spots with plain abrasives.

3. If 25° F. or below and falling; snow, sleet, or freezing rain; wet or sticky.

Immediate treatment: For snow or sleet, a salt-calcium chloride mixture (two parts of salt to one part calcium chloride) is applied at 400 lb./mile. For freezing rain, the same mixture is spread at the rate of 200 lb./mile.

Subsequent treatment: If snow or sleet continues and accumulates, operators plow and repeat chemical mixture application. If freezing rain continues, reapply chemical mixture at same rate. If storm ceases, maintain patrol until pavement is clear and dry.

4. If 10° F. or below; snow, sleet or freezing rain; pavement has an accumulation of packed snow or thick ice.

Immediate treatment: For snow or sleet, plow and concurrently apply abrasives at the rate of one cu. yd./mile. For ice, apply abrasives at same rate.

MAINTENANCE FLEET ON

Trucks
- 2 Marmon-Herrington, 5-ton
- 16 Oshkosh, 5-ton
- 43 Ford, 2-ton
- 6 Chevrolet, 2-ton

Snow Plows
- 6 Gledhill (Model 10-T-R-SP)
- 8 Gledhill (Model V-9-5)
- 43 Good Roads (Model 712)
- 2 Ross (Burch) (R-30)
- 14 Ross (Burch) (R-30)
- 1 Meyer (Model ST-78)

Snow Plow Wings
- 16 Ross (Burch) (Model R-3-10) on 5-ton trucks

Graders
- 8 Galion (Model 104)

Backhoes
- 2 Henry (Model C-10-H)

Front-End Loaders
- 8 Hough (Model HFC)
- 8 Tractomotive (Model TL-10)

Power Mowers
- 8 Scythette (Model T)
- 16 Worthington (Tractor type)
- 10 Cooper (Rotary, 21")
- 10 National Sickle Bar 38" (2-wheeled)

Fire-Fighting Trailers
- 8 Gorman-Rupp (with Wisconsin engines)

Portable Cement Mixers
- 3 Jaeger, Model 3½ S
- 1 Wonder mixer, Model 3½ S

Tractors
- 9 Gravely 2-wheel (garden type)
- 4 International 300 (utility type)

Grit Spreaders
- 42 Good Roads (Model HYD. JFT 8) hopper-type
- 7 Good Roads (Model ASN) tailgate type

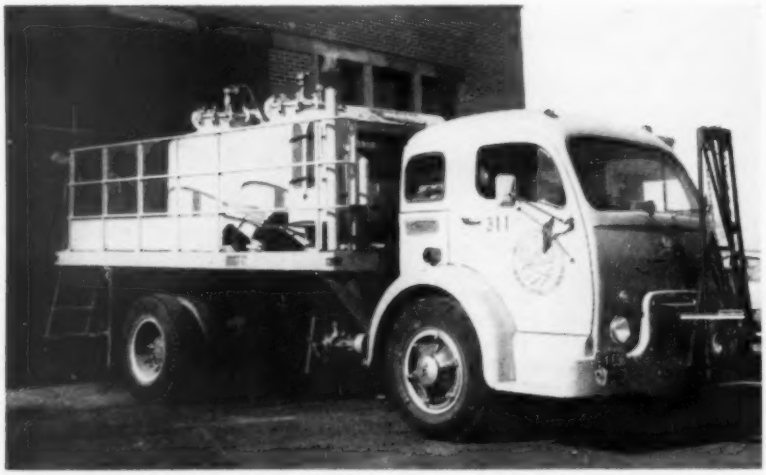
Paint Striping Machine
- 2 Kelly-Creswell (Model B3P)
- 1 Wald (Model 12)

Power Plants
- 8 Kohler, platform-mounted portable (Model 5 MM 21, 5 kw)
- 1 Kohler, trailer-mounted portable (Model 12 RSH-81, 15 kw)

Truck Operating Costs on Pike

It costs the Ohio Turnpike Commission $450,000 to keep the cross-state road open during a winter season. One two-day storm at 1958 Thanksgiving time cost $44,000 in overtime and materials.

Under an admirable cost control system, engineers continuously compile cost experience and analyze the performance of men, materials, and machinery to obtain the most effective results. Typical of this activity was the organization's recent analysis for its 48 two-ton trucks; maintenance and repairs for 1958 came to $28,923.20; gasoline and oil, $25,161.53. The average over the 846,799 total miles operated came to 6.3¢ per mile direct cost.



● **The Commission's heavy-duty paint striping truck—a White 3000 equipped with Kelly-Creswell and Devilbiss gear.**

Subsequent treatment: Apply salt-calcium chloride mixture at rate of 400 lb./mile. When snow or ice becomes slushy, remove with blades as required. Repeat chemical application and blading until pavement is clear.

By following these procedures scrupulously, the Turnpike engineers have found they can handle just about any situation. "We've found that if you 'knock yourself out' to get the snow and ice off immediately and try to keep that pavement bone dry, a lot of snow will blow across and not pile up."

● *Materials Requirements.* Turnpike offered report that the 1958-59 winter's maintenance program required 20,000 tons of rock salt, 2,000 tons of calcium chloride, and 2,000 tons of abrasives.

Materials account for $360,000 of the $450,000 budgeted for ice and snow control in the 1958-59 winter. The engineers have found that materials mixing, stockpiling and re-dressing of stockpiles will cost $8,000; that application and snow removal will cost $80,000.

● *The "Hot" Mix.* Dependence by Ohio Turnpike leaders on a combination of calcium-chloride and salt to burn off ice and hard-packed snow has aroused the interest of other maintenance engineers

THE OHIO TURNPIKE

Water Pumps
- 2 Gorman-Rupp, portable (Model 3209)

Safety Cone Retriever
- 1 Kelly-Creswell

Rollers
- 2 Huber-Warco 5-ton retractable tandem roller

Pavement Crack Sealers
- 7 Lincoln
- 1 Stewart-Warner

Electric Welders
- 2 Hobart (Model GHB 3183)

Trailers
- 2 Miller, 10 ton (Model JS)

Paving Material Spreaders
- 2 Flink "Even Seal" towed with trailer

Powered Sweepers
- 2 Wayne, self-propelled (Model 450 and 550)
- 2 Littleford, towed (Model 108)

Air Compressors, Portable
- 3 Chicago Pneumatic (Model 125 Rotary)
- 4 Jaeger (Model 125 Rotary)
- 1 Davey (Model 105-VD Piston)

Steam Cleaners
- 2 HyPressure Jenny (Model JO 120 and SM)

Mud Jacks
- 4 Koehring #10

Sewer Cleaner
- 1 Flexible (Model PDX 50)

Tar Kettles, Two-Wheel
- 1 White (Model F-3)
- 1 Littleford (Model 84 HD #6)

Chain Saws
- 2 Clinton (Model 5 BM)

Seeding and Mulching Equipment
- 1 Finn Hydro Seeder
- 1 Finn Mulch Spreader (Model 10)
- 1 Finn Klodbuster

Concrete Saws
- 1 Clipper (Model C-250-A)

Mechanical Tampers
- 2 Barco Vibra-Tamp

around the country. Following recommendations developed as the result of recent research, and with a few angles of their own, the Ohio officials have come up with a "hot" mix for clearing ice that they swear by (one part calcium chloride to two parts salt).

The theory is that the addition of calcium chloride in that ratio to salt will "trigger" the melting action of the salt at temperatures when this chemical by itself is slow-acting. (Salt is most effective at 25° to 32° F.; calcium chloride acts at temperatures down to zero.) The

(Continued on page 122)

● **Maintenance chief L. G. Byrd, studying accident-report map with traffic engineer Ben Bowman. Byrd heads a group of relatively young men whose job it is to keep tightening up the winter maintenance operation to the point where "accidents are accidental." Every accident is plotted on this map, as an aid to study of accident patterns along the 241-mile road.**

● **Large maintenance shops are located along the cross-state toll road, serving as headquarters for each 30-mile section. Radio tower keeps in touch with 138 maintenance vehicles.**

Rubber-tired dozer plugs $10 per hour profit leak

The problem was sand. 3,400,000 yds of blow sand, playing its usual havoc with crawler tracks. Particularly with push-dozer tracks. Contractors, rebuilding a federal highway in Indiana, found their 320 hp pusher, working this rough material, needed a track repair job *every 700 hours*. Cost, $7,000! Or $10 an hour—over and above normal operating costs.

When need arose for a second pusher, contractors got ready to shell out another $10 an hour.

Solution—rubber

"Before we do," said the project supt and a 29-year veteran in the business, "let's look at the latest rubber-tired dozers. Sand shouldn't be nearly as hard on rubber as it is on steel tracks."

"Agreed," management answered. "But any rubber-shod rig we buy *must* do as good a pushing job as our 320 hp crawler!"

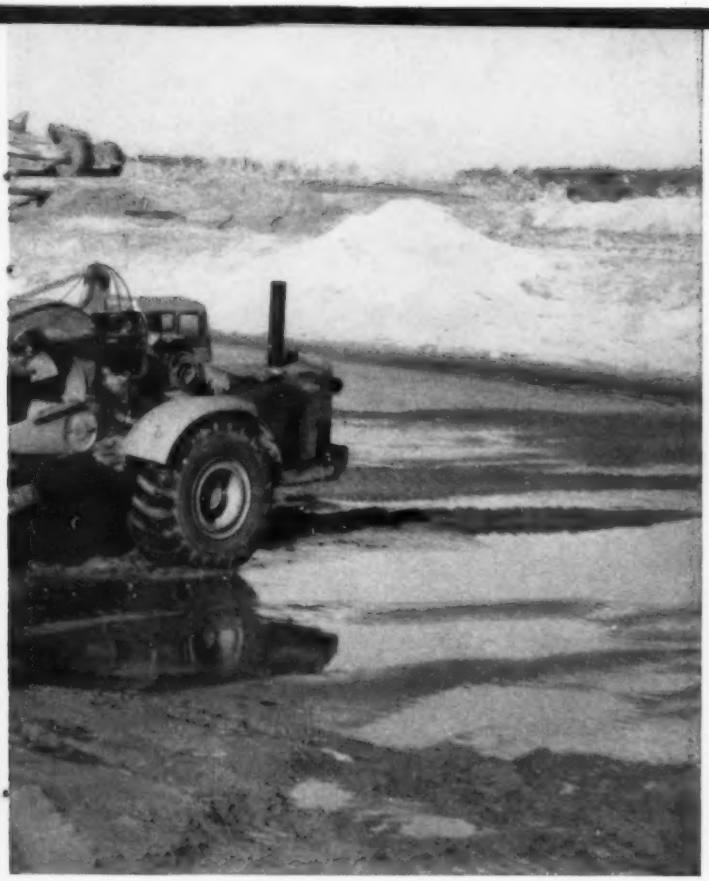
One machine did. A 375 hp Michigan Model 380 Dozer brought in by the Clark distributor. Contractors bought it!

15 pay yds: 20 to 80 seconds

From that day on, the Michigan and the big crawler

High dozing speeds let the one Michigan do work of two crawlers, spreading fill.

Fast backup, power-shifted at flick of small lever, saves deadhead time between push cycles.



Maintenance costs went way down when Michigan Dozer went to work on this highway relocation.

together handled push-loading of a fleet of seven 25-yd scrapers. Performance of the two pushers was very much the same. Per-scraper load time, either loading unit, varied from 20 to 80 seconds (depending upon the soil). Scraper loads, with either crawler or Michigan, measured 15-plus pay yds. Output, per pusher, with scrapers on one mile haul, ran about 2,150 pay yds per 8-hour day.

Speed provides bonus

Why was the contractor so pleased? Well, he eliminated $10 an hour in track maintenance, at no decrease in push-loading efficiency. He also got a bonus in speed. One day, for instance, the Michigan alone spread all fill . . . a job which normally took two 191 hp crawler dozers. Another time, when the pushers had to work two different borrow areas in one day, the 25 mph Michigan reached the second site so quickly it got in half an hour's work while the crawler was still creeping along the road shoulder. And the firm expects to use the Michigan on still other applications on other jobs. Says the supt, "This unit sure is *not* just a special-purpose sand machine. It can do as good a job as a crawler—or a better one—on about 70% of what some people call "big crawler" applications. Mud, not as good maybe. But sand, clay, dirt—excellent!"

See for yourself. Write our sales department, in Benton Harbor for data. Or call your nearest Michigan Distributor for a demonstration.

CLARK® EQUIPMENT

Michigan is a registered trademark of
Clark Equipment Company
Construction Machinery Division
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In Canada: Canadian Clark, Ltd.
St. Thomas, Ontario

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Veteran operator analyzes the new Michigan Dozer

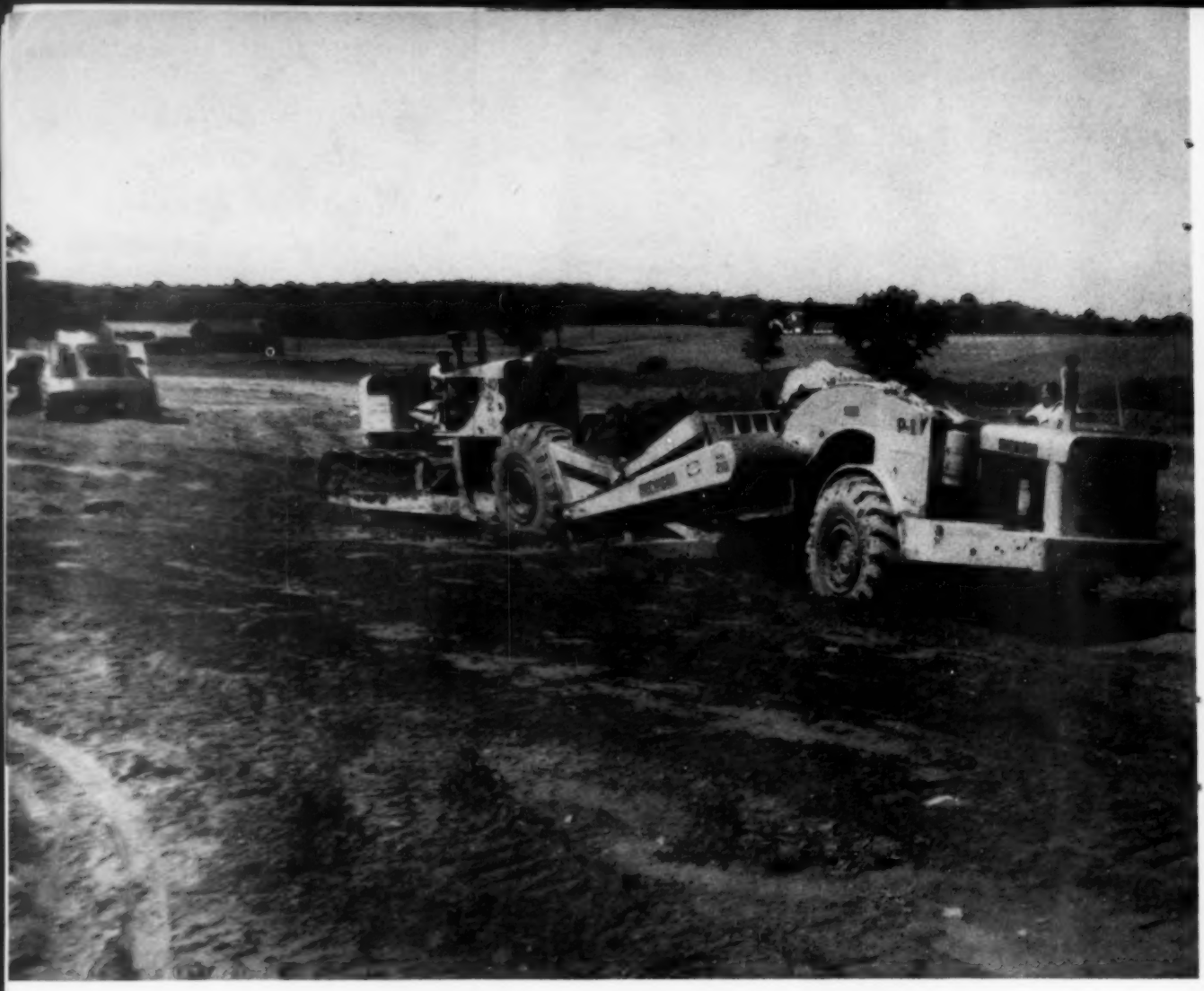
(The writer used to be the contractor's boss scraper operator—the man who paced the fleet, helped decide which section of the borrow should be cut, etc. He tested the Michigan, now operates it. Here's what he says . . .)

"What's the difference between a crawler and a Michigan pusher? Well, first of all, you get an entirely different view of things from the Michigan. You sit higher. You look down on the scraper operator. You can see his signal or signal him without looking up, over or around a pile of dirt. You can see the load coming into the bowl and your blade contacting the scraper pushblock.

"Sticking with the pushblock is easier, too. If the scraper starts to drift to one side, all you do is turn your steering wheel slightly. No need to lock a track or skid and slide around. Or if the scraper starts to bog down, the Michigan's torque converter automatically gives you less speed (and more power) without foot-clutching or shifting gears. If the scraper starts to run away, you automatically get more speed (and less power). So you and the scraper work together from one end of the cut to the other.

"With the Michigan, you normally can push faster than with a crawler, thus get better load boiling and tighter fuller packing. I normally push at speeds up to 6½ mph (second gear). Sometimes, in tough going, I power shift down to low by moving a lever the way you do on an automatic transmission car. (No clutching.) Then, I work at about 3 mph. On easy pushing, I move up to third gear (13 mph). I back up at 13 mph too.

"Here's another trick I've learned. After pushing a pan through the cut—especially if the swath is rough and bumpy—I down-pressure the blade to ground level, and power-shift into reverse. The blade chops off all high points, makes the ground smooth again. It means better travel for the next pan you push through! And more production!"



"Comparative studies sold us," reports N. Y. contractor

His 3 Michigan Tractor Scrapers live up to expectations, prove particularly fast on hilly hauls.

When Watertown Construction Co, Watertown, N. Y., decided to buy scrapers for their earth-moving operations, owners Ralph and Richard Buckley had some pretty basic requirements in mind.

They wanted units that would be easy to load, yet would pack in a high percent of *pay* yardage. They wanted speed on the haul, particularly where grade changes were frequent. And they wanted a high degree of availability to keep production flowing and to keep repair time and costs down.

Michigans win comparison test

To check their needs first-hand, they went to the people who knew best—other scraper users. They watched jobs. They made time studies. And they came away most impressed with one make—*Michigan!*

That was last spring. **Today,** Watertown Construction Co owns three 19 yd Model 210 Michigan Tractor Scrapers. "We *could* have bought 10½ yd or 29 yd Michigans," says Dick Buckley. "But the 19 yd size best fit our needs. We liked its price, also the financing arrangements and the service offered by our Michigan distributor (J. C. Georg of Syracuse)."

Fleet output: 5,040 yds daily

Typical of Michigan performance is the job pictured—a 5 mile, 200,000 yard subcontract (from Warren Bros) of new county highway north of Syracuse.

Loading in wet sandy material, with help of Watertown's veteran 225 hp torque

Loads average 14 to 15 pay yards each. Ability of the 262 hp Michigan Tractor Scrapers to partially self-load cuts pusher-load time.

Within seconds after leaving borrow pit, power shift-torque converter Michigans are hauling at top speed—over 30 mph.

Spread is made evenly in lifts as small as 1 to 2 inches. Scraper *cuts* smoothly and accurately too, thus minimizes dozer ditching and trim time.

converter tractor, takes average of 30 seconds. Loads average, per cross-section computations, about 14 pay yards each.

Haul is made almost entirely in top gear—*over 30 mph.* Where grade changes are encountered, operators change gears instantly at the flick of a lever—no clutching. Two important parts of the all-Clark power train, the power-shift transmission and the torque converter, do the work. Typical 5,400 ft cycles average just over 4 minutes. Fleet output averages 36 loads per 50-minute hour, 360 loads per 10-hour day.

Availability has been better than 98%, according to Larry Balcom, master mechanic. "Since we started the job last spring," he says, "our total downtime for all three pans has been less than one day!"

More quotes . . .

Ralph Buckley, co-owner: "These are the fastest scrapers I've *ever seen* . . . high speed gives us *several extra loads per hour.*"

Dick Buckley, co-owner: "Our Michigan Tractor Scrapers get good loads no matter what the material. They move fast even through wet, spongy footing. Fuel consumption is low too."

Carl Runge, supt: "It's your speed that counts and if you've got the power—and the power train—you can get the speed. *These* pans have more usable horsepower per yard of capacity than any machine I've ever seen."

W. E. Singleton, operator: "Less bounce and less motor noise make the Michigans easy to operate fast all day long."

We at Clark: "See for yourself. Let your Michigan Distributor show you a Michigan Tractor Scraper *in action.* Call to arrange a date. No obligation."

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Problems in Widening an Arterial Bridge Under Heavy Traffic

● Old outer girder is in new position (left), steel struts holding it are in place, bare steel floor beams are seen supported by hangers from steel falsework girders.

How a 4-lane structure in a Washington, D.C., suburb was widened to six lanes, the contractor and the steel supplier collaborating on some "ticklish" procedures.

An example of a type of salvage and modernization effort which holds wide interest today, as traffic growth turns more and more bridges into bottlenecks.

Following is an account of a bridge widening job handled recently under some difficulties. The project is the B & O Railroad overcrossing in suburban D.C., just outside Washington, where New Hampshire Avenue was in need of widening from four to six lanes.

The deck girders were shifted, new structural work done and the deck restored, section by section, keeping at least two traffic lanes in service at all times.

Trains rush under this 84-foot skewed structure every 20 minutes, ruling out any chance to handle major renovation work from the ground below. The superelevated, curved track also prohibited

use of a locomotive crane for steel handling and erection.

Another complication was the deck design of this 25-year-old concrete decked structure.

Each outside steel girder—supporting the concrete curbs, sidewalks and parapets—is about 1½ ft. deeper than the interior girders which support the roadway. If each sidewalk were removed and the new pavement laid in its place, there'd be six lanes all right, but the old girder would project about 1½ ft. above the road surface. These deep girders had to be either scrapped or moved to a new position in the renovated bridge.

Modjeski & Masters, designers of the bridge, together with the bridge staff of the District of Columbia, decided on this solution: Move each deep girder outward the width of one traffic lane, to the point where the new walkway would be, and in their old location set new girders of the proper size. New floor beams and stringers would be added, at the same time, to connect the new and old girders and to support the new traffic lane and new relocated sidewalk and parapet on each side.

● *Carrying Out the Plan.* S.T.G. Construction Company, New York City, holder of the widening contract, worked out a plan for temporarily supporting the existing floor. Then Bethlehem Steel Company, specialists in steel fabrication and erection, was called in to disconnect the existing exterior girders, move them to new location and furnish and erect the new girders and floor framing.

First step was to extend the abutment 12 ft. on each side of the bridge. The S.T.G. crewmen, working one side of the bridge at a time, poured the new bridge seats and stripped away the old concrete curbs, sidewalks and parapets. (See "Dynamiting Did It," describing the blasting involved, in Roads and Streets, June, 1959).

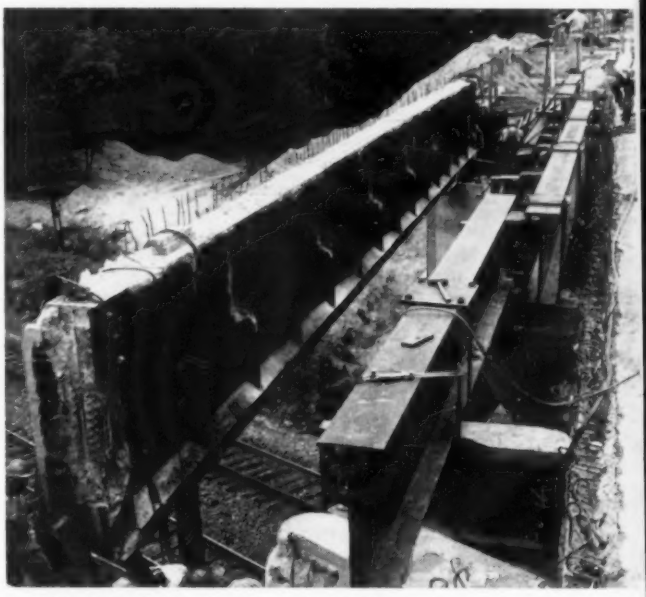
With the outside girder exposed, and part of the existing floor beams and stringers framing into it also showing, S.T.G. erected falsework to take the load off the old girders. A three-section 36 WF falsework beam, supported on timber bents, was set up to take the load until a new girder was in place. Hangers from the falsework beams were looped around the floor beams to pick up the load.

Bethlehem ironworkers took over. The 84-ft.-long, 8-ft. deep girder on either side was not an easy load for a crane, or even a pair of ordinary cranes. It was still heavily encased in concrete and weighed over 80 tons. Instead of using cranes, Bethlehem decided to "inch" the girder into its new position by a series of vertical and horizontal precision movements with hydraulic and wedge jacks.

S. T. G. Construction Company men tightened up on the hanger bolts, and Bethlehem Steel Company men then cut out all rivets to free the old girder from the existing floor beams and stringers. This put the load on the false work.

● *Jacking Procedure.* A jack was then placed under each end of the girder to raise it vertically. Under one end a 200-ton wedge jack was set up on the ground below the bridge on timber cribbing,

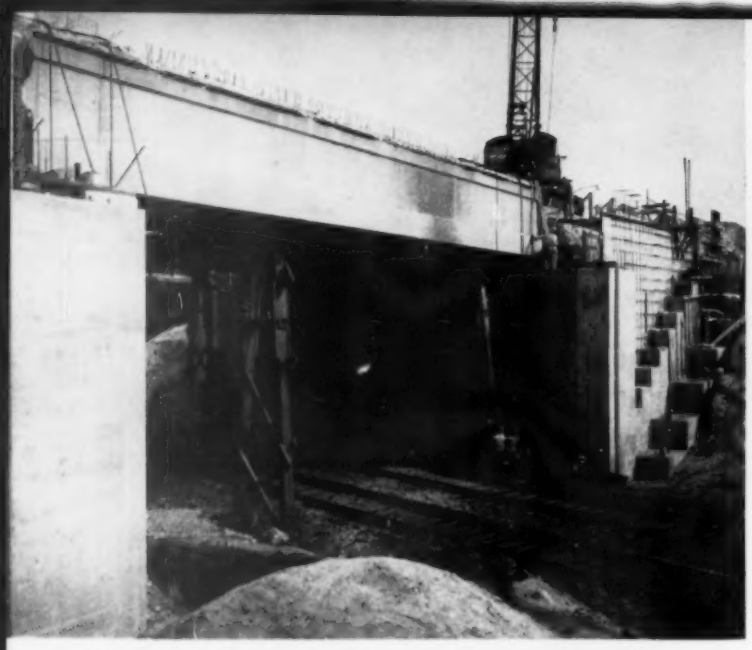
● **Swinging a welded pair of old rails for setting as a skid support during lateral jacking of girder.**



● **Old girder being jacked horizontally to its final position. Jacking on two ends of girder is handled simultaneously.**

with a long 10″ WF 49 steel post from jack to girder. Under the other end a 50-ton hydraulic jack was placed directly on the bridge seat in front of the girder shoe. The combined capacity of the two jacks was more than enough to lift the 80-ton girder, but extra capacity was desired to overcome the friction of the floor beam framing, as well.

After attaching safety tiebacks to the girder, two jacking crews carefully and evenly raised the girder six inches. All jacking was stopped whenever a train rumbled by. The crewmen removed the existing shoes from the anchor bolts, then placed short skid beams and blocking under the ends of the girder where the shoes were.



● Close-up jacking, northeast corner of bridge.

● Vertical jacking; 200-ton wedge jack sits on timber cribbing with 10 WF 49 steel post from jack to girder. Timber A-frames support falsework girders.

The two interior lanes of traffic were kept open on the bridge during the entire operation.

Next, the men mounted 25-ton hydraulic jacks on the heel of the skid beams, and jacked the girder horizontally 7 in. at right angles to itself. Tiebacks were paid out as the girder cleared the floor beam ends.

Keeper plates, made with slotted holes, were then attached from floor beam to girder stiffener to permit vertical movement of the girder.

Again, the girder was jacked vertically — this time just enough (less than an inch) to remove the short skid beams. With the short skid beams out, the men placed blocking, 16-ft.-long steel rails; also a longer skid beam fitted with special temporary "sliding" shoes, on each bridge seat.

With safety tiebacks and struts in place, the men lowered the girder until the skid beam was on the rails. The 16-ft-long rails were placed on the bridge seat parallel to the skewed abutments. The rails were greased to facilitate the sliding of skid beam on rail.

The jacks on each end were worked in unison to move the girder horizontally about 2½ ft., using the guide angles on the skid rail. This 2½ ft. movement allowed the men to get in behind the girder and install track jacks. These jacks then moved the girder the additional 9½ ft.

Once in its final position horizontally, the girder was raised by the two vertical jacks just high enough to remove the "sliding shoes," skid rails and beams and install new shoes. The girder was then bolted into place on the new bridge seat.

● *Second Girder Goes Faster.* It took Bethlehem ironworkers four days to make this conversion on one side of the bridge. Experience gained from the first girder was put to good use on the second; it took only three days.

Then with two crawler cranes—one positioned at each end of the bridge—Bethlehem crewmen in one day erected the two new 25-ton, 6½-ft.-deep girders, and completely tied them in to the relocated girders by erecting all the new floorbeams and stringers. Since the old girders had deflected under the concrete deck and encasement load, the rivet holes in the floor beams didn't match up with those in the new girders. In anticipation of this, rivet holes were filled with weld metal and new holes drilled as necessary to make the connection, using the new steel as a templet.

After all steelwork was in place, S.T.G. began finishing up the job by removing the falsework, pouring the new roadways, curbs and sidewalks and installing the parapets to protect pedestrians.

● *Personnel.* H. Elerding was project superintendent for S.T.G. Construction Co. Overall Bethlehem steel erection work was under the direction of G. P. Bullard, manager, eastern erection district, fabricated steel construction division. G. E. Clayton was Bethlehem's project manager; C. L. Stroble, project superintendent.

Florida Road Board Has New Bid Policy

Under a new policy on highway and bridge construction, announced by Florida State Road Board Chairman Joe Grotegut, no project will be advertised for bids until the right-of-way has been acquired or acquisition is in sight.

Grotegut said a contractor had withdrawn a bid on a Lake County project because of right-of-way delay. The contractor said he was unable to complete a resurfacing job in Fruitland Park at a figure of $137,579 submitted last December.

The road department could not award the contract earlier because of delays in acquiring right-of-way. While the policy of taking bids prior to obtaining land has been a long-standing problem, Grotegut said, it has not caused serious complications in most cases. It was enough of a problem, however, to warrant a change.

Right-of-way for road and bridge projects in Florida is furnished by the counties. Many counties have run into delays, primarily due to lack of funds. The new policy, the chairman said, was bound to result in some delays in construction, but it also might serve to spur counties to move more quickly.

Runaway Specs, Tough Now, To Get Tougher

Engineers and industry representatives combined talents to find answers for new and more exacting requirements for Air Force Pavements as previewed at the USAF Pavement Conference, held at Berkeley last month.

By H. K. Glidden

Contributing Editor to Roads and Streets

Anyone who thinks the days of "just getting by" aren't over in military runway construction should have been at Berkeley, California, last month when Air Force leaders spelled out the mandatory requirements brought about by delicately-instrumented jet aircraft operations and a host of new and critical materials. For both contractor and engineer there is just one phrase for these requirements. That is "exactingly tough."

Key military personnel, responsible for the design, construction and maintenance of the U.S. Air Force's half-billion square yards of pavements, met July 27-31 at Berkeley for the Third World-Wide USAF Pavement Conference. Engineers from the Headquarters U.S. Air Force conducted the symposium. In addition to representatives of major Air Force commands and subcommands from all over the world, governmental agencies participating included the Corps of Engineers, Bureau of Yards and Docks, Federal Aviation Agency National Guard Bureau and the Bureau of Public Roads. Canada, France, Germany, England and Japan and The North Atlantic Treaty Organization had engineers in attendance. Representatives of 25 industries, 12 associations, California Division of Highways, United Airlines and Douglas Aircraft brought the registration to over 250.

Four 8-hour, tightly scheduled days were devoted to the presentation of 55 papers on almost every conceivable component, adjunct and feature of Air Force pavements. Industry delegates included spokesmen for associations and manufacturers representing concrete, asphalt, lime, tar, crushed stone, sand and gravel, slag, ready-mix, concrete pipe, joint sealers, pavement markers, chemicals and various types of construction and maintenance equipment. Industry and government engineers reported in detail on research and development of test procedures.

Bound copies of the proceeding are now being prepared and will be furnished to conferees by Headquarters, U. S. Air Force.

One day was devoted to field demonstrations held at Hamilton Air Force Base. Fifteen equipment and materials representatives demonstrated their latest products under field conditions.

● *The importance* of the pavement program to the Air Force was highlighted in an opening talk by The Honorable John M. Ferry, Special Assistant for Installation, Office of the Secretary of the Air Force. The Air Force today, said Mr. Ferry, is custodian of 500 million square yards of pavement, 75 percent of it heavy pavement used by aircraft—the equivalent of 36,000 miles of 34-ft. wide road paving. The 25 percent portion includes roads, streets, sidewalks, parking and storage areas. The total air force pavement investment exceeds $5 billion.

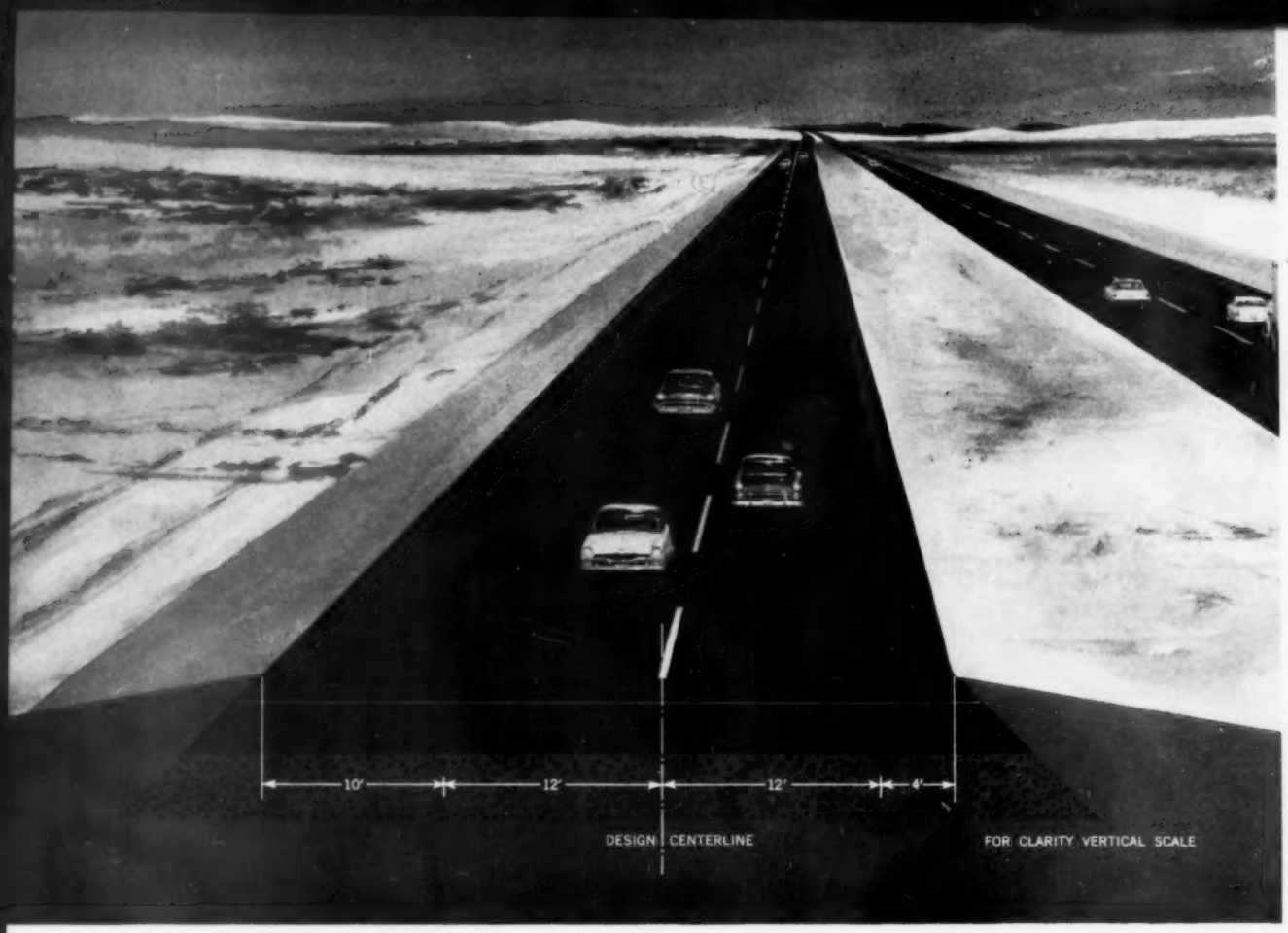
Mr. Ferry pointed out that the Air Force has economized in its program of strengthening runways for heavier jet bombers. While the B-52s need stronger runways than the B-36s or B-47s, this strengthening has been done chiefly by constructing only keel sections, or segments of heavier concrete, in areas subject to the heaviest landing or taxiing use. It has not been possible to reconstruct all paving to keep pace with plane evolution. The policy rather has been to take calculated risks and operate craft far heavier than the pavements were designed for. In many cases, taking of these risks has been justified by the end results—in others, expeditious action has been required to strengthen pavements.

"The era of risk is not over, by a long shot," said this speaker.

Much new paving has been required in connection with the Air Force's program for dispersal of tanker aircraft to strategic locations, as a means of supporting air-to-air refueling. This program is nearing completion. Also, much paving has been necessary for dispersal parking at most bases where tankers are located, and in some cases taxiways and runways have had to be strengthened to accommodate the heavier tanker loadings. The 100,000-lb. dual wheel loading has been sufficient for this paving, noted Mr. Ferry.

An interesting development in connection with the rising weight of planes has been the unexpectedly good service given by some older pavements, which theoretically should have failed. Some pavements have failed, and some have been prevented from breaking up by being given overlays. "But in other instances, runways have stood the

(Continued on page 115)



Arizona's First Interstate

Experience with veteran 2-lane Asphalt

Arizona is a big state with a low population density—which means it needs plenty of roads. But there aren't millions of Arizonans to pay for them. Every dollar counts.

These are some of the reasons why most of Arizona's roads traditionally have been of economical Asphalt construction. Time and again, since the State began to pave, Asphalt pavements have stretched available funds over more and more of these long Arizona miles than could any other pavement type.

Now, along with the rest of the states, Arizona has launched a vast new road-building program. And even though more federal aid is available than ever before, these roads, too, are turning out to be Asphalt-paved. You don't have to look far for the reasons.

Arizona's veteran Asphalt-paved highways have proved themselves as rugged and durable as they were economical to build and maintain.

U.S. Route 66 between Winslow and Holbrook is an example. First paved more than 25 years ago (with Asphalt and sand!), this pavement is successfully supporting heavy traffic undreamed of when it was first built. "Double" trucks by the dozen barrel over it at 60 MPH. So does the bulk of Arizona's east-west traffic.

Now this veteran main artery, still in the prime of its life, is being given local traffic responsibilities. A new divided Interstate Highway (Route 40), carrying through traffic, will parallel it. The initial section of Arizona's new Interstate 40 is shown above. It is a 5.6 mile stretch between Winslow and Holbrook.

With no aggregate larger than ¾ inch available (and most under ¼ inch), only Asphalt construction could have been used to build this section of pavement up to Interstate standards. Total cost of the pavement structure was $1.75 per square yard!

Segment Asphalt-Paved!

pavements leads to decision

The cross section above shows you in detail how low-cost Asphalt materials were used to give this pavement lasting strength despite the scarcity of aggregate.

Notice, first, the use of Asphalt in the 3-inch base. This base, a sandy gravel, was road-mixed on the selected sub-base using RC-3 liquid asphalt.

Notice, second, (see right roadway above) that the 3-inch leveling course was asphalt plant-mix laid down in two courses. A novel between-course inter-lock was provided by "waffling" the lower course while still hot with a 4-inch square grid pattern, impressed about ⅜-inch into the surface. A tack coat was applied and a second course constructed. Then, a ½-inch wearing course was laid to insure a non-skid surface.

Notice, third, that both base and surface courses are uniform across the whole width of the road, shoulders as well as traffic lanes.

Notice, fourth, the use of Asphalt curb to provide controlled drainage, prevent embankment erosion and aid safety.

BEAT SCHEDULE BY TEN WEEKS

With today's equipment, modern heavy-duty Asphalt concrete pavement is being laid at record, reputation-building, tax-fund-conserving speeds. In this case, construction was completed 10 weeks ahead of schedule . . . in plenty of time to accommodate the bulk of the summer tourist traffic.

Modern Asphalt concrete pavement can help **you** speed your highway modernizing program. It provides, as well, strength, durability and economy in full measure. Specify it for your Interstate Highways. Primary and farm-to-market roads, too.

Ribbons of velvet smoothness...
***ASPHALT**-paved Interstate Highways*

THE ASPHALT INSTITUTE

Asphalt Institute Building, College Park, Maryland

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The "Newer" Paving Materials

Epoxy resin was probably the most repeated word at the conference. One or more of its aspects was of direct concern in at least eight presentations. Epoxies were pictured as being so varied and versatile that a serious danger exists in the possibility of ascribing miracle powers to them. B. U. Duval, Corps of Engineers warned, "Making the name 'epoxy' synonymous with magic can hurt its use." The Corps is issuing a bulletin soon describing the uses. Epoxy resins were shown to be a panacea in both new construction and repairs.

Epon-Asphalt was another "new word." H. W. Swanson described Shell Oil Company's Epon-Asphalt as a mixture of asphalt and epoxy resins. Among its outstanding characteristics, Swanson emphasized its tensile and compressive strength, high resistance to petroleum solvents and alkali, and the fact that it will not soften when exposed to heat. He said experience shows Epon-Asphalt can be handled in a standard hot-mix plant and spreader at a cost of $40 to $50 per ton.

In general, epoxy resinous compounds are applicable in any situation where two materials need to be securely bonded together or a thin tough overlay patched on. Mr. George Whitesides of Geo. Whitesides Inc., described a number of uses in the repair of concrete pavements. He estimated the cost of epoxy concrete to run from $400 to $600 per cu. yd.

The satisfactory use of epoxy resins in that state's construction and repair of pavements and bridges was shown by E. D. Botts, California division of highways, using slides.

TOUGH SPECS

(Continued from page 111)

overloads admirably and with little sign of stress," said this speaker.

All new bases built since 1950, Mr. Ferry reminded, have only one runway. And where older bases have been modernized, only one of the runways has been lengthened, as a rule. This single-runway concept has been adhered to as an economy measure, and the economy has extended to maintenance.

Proper design has had a great bearing on maintenance cost, said Mr. Ferry. He admonished all agencies to correct design deficiencies, so that once a pavement is turned over to the military establishment, it will perform adequately without heavy use of funds for repairs.

In concluding his remarks, Mr. Ferry said, "at the secretarial level we favor no particular type of construction or construction material. The Air Force requires that pavements satisfy certain load requirements for a predetermined cycle frequency.

● *The purpose* of the conference was spelled out in detail by Col. James F. Carney, Chief, Maintenance Operations and Engineering Division, Directorate of Civil Engineering, DCS/O. He said, "This meeting is to help you (AF Base personnel) to do your job better."

Col. Carney explained that these pavement conferences are a component part of a fairly large and comprehensive "Pavement Maintenance Improvement Program." He said, "The PMP (initiated 18 months ago) was conceived of necessity because the maintenance of pavements in the Air Force was deplorable."

To illustrate how little maintenance and repair had been previously accomplished, Col. Carney cited that only $34 million was spent for such items in the seven-year period 1950 through 1956; routine or preventive maintenance has been virtually non-existent. This was due largely to lack of trained personnel and to the operational committments requiring continual runway operation.

The use of the phrase "exactingly tough" pertaining to future AF specs is largely predicted on the PMP training program described by Col. Carney. It is intended to train large numbers of personnel and provide them with the tools needed for these specialist to be realistically tough. Greatly condensed, this program has six points or steps: 1) publication of a maintenance manual; 2) systematized day-to-day procedures and planning of work including that to be deferred for contract; 3) getting better coordination of effort; 4) personnel training; 5) world-wide conferences (such as that at Berkeley); and 6) a "follow-up and feed-back program for information on better design, construction and maintenance procedures.

● *Role of Associations.* Representatives of twelve associations were outspokenly present for a dual purpose; they want their products used wherever competitive and applicable, but they want them used correctly. Their demonstrated watchdog attitude is another justification for the phrase "exactingly tough." It was hard to escape the impression that qualified industries want to reap the benefits of their research, and are going to do everything in their power to prevent careless or ignorant use of their products or materials.

The associations offered educational service and prepared manuals on purchase procedures and use. The Joint Sealer Manufacturers Association's efforts in this regard were typical. In addition to a slide-illustrated paper presented jointly by Chris Seibel, president, and M. O. Huntress, secretary, the association presented for AF consideration a complete two-part (new and existing pavement) specification and a precedure for joint sealer sampling and testing.

The Portland Cement Association's airfield consultant, W. G. Westall, announced and distributed its new "Concrete Pavement Inspector's Manual." PCA representatives stressed inspection and control of concrete, proper joint construction, and the necessity for cleaning cracks and joints before sealing.

Asphalt paving contractors were represented by Chas. R. Foster, Coordinator of Research, National Bituminous Concrete Association. In his paper, "A Look at Bituminous Pavements Through the Con-

On Material Usage

The following comment was gleaned from the USAF pavements conference at Berkeley, in supplement to the accompanying review:

Crushed Aggregates

The properties, influence and uses of crushed aggregates were put in a new light. J. E. Gray, engineering director, National Crushed Stone Association, said that aggregates can no longer be considered inert fillers. Rather, they must be classed as active ingredients having widely varying properties, applications and design considerations.

D. W. Lewis, chief engineer, National Slag Association, called attention to the different uses of air-cooled, granulated and expanded slag produced as by-products of blast furnace operation in steel making. Mr. Lewis noted the resistance of blast-furnace slag to high temperatures.

Ice Control

Among the strictly chemical highlights was Bernard F. Thomas' discussion of the Dow Chemical Company's research and experience, in the removal of snow and ice, done with calcium and sodium chloride, used individually or in combination.

Asphalt Rejuvenation

F. A. Rostler, director of research, Golden Bear Oil Co., illustrated "remarkable results" in the rejuvenation of asphalt pavements by chemical means. The process is based upon restoring, to the asphalt in the pavement, one or more of the basic bitumen ingredients which may have oxidized or otherwise become depleted.

Pavement Evenness

The ultimate criteria for runway pavement smoothness is still undetermined, but may well involve determination of the wave length pattern of irregularities. Dr. John Houbolt, Aeronautical Laboratory, Langley Research Center, National Space Agency, described studies which showed that a straight-edge satisfactory pavement surface might still contain unevenness damaging to aircraft. This roughness can be pinpointed only by a wave-length study.

Night Visibility

The elimination of the hazards of the "black hole" in night landings is the subject of much research by producers of airfield marking materials. Representatives of both the Minnesota Mining and Mfg. Co. and the Prismo Safety Corp. stressed the importance of exacting inspection of materials and methods of application.

tractor's Eyes," he urged that, for pavements carrying aircraft, the Air Force use the same design and construction control procedures for maintenance as for new paving. For roads and streets, NBCA suggests that local specifications be used. Also that for all work the end-product type of specification be used whenever possible, since this type of specification will usually bring quality pavements at the lowest possible price.

NBCA's contractor members welcome adequate and reasonable quality control inspection, said Foster. The contractors recognize that the future of the asphalt industry depends on the contractors turning out good jobs. NBCA members pledge cooperation in every way possible and ask only that inspection details continue to be uniformly applied.

The Coal Tar Pitch Emulsion Council offered engineers and maintenance men a pamphlet on handling their product for pavement sealcoating. Paul F. Phelan, Technical Director of Road Materials, Koppers Co., Inc., described tests and installations where tar pitch emulsion surface treatment had proved highly solvent-resistant, and able to withstand the heat of jet blast to a high degree. In the instances cited, the underlying pavement, rather than the tar pitch emulsion surface treatment, failed from the heat.

For the National Lime Association, R. S. Boynton, general manager, pictured a rapidly growing use of hydrated lime for stabilization purposes. He stated that lime has been found to be highly effective and economical when used with most clays and some silts. He stressed the resulting frost-resistant properties. Nine papers gave attention to joint sealers and equipment for cleaning and sealing of joints and cracks, in both portland cement and asphaltic pavements. The discussions centered about new products. And again, the terms were "new" and, "results akin to magic." A composite review of these papers will appear in a subsequent issue of Roads and Streets.

● *Acknowledgements.* In closing the conference, Col. E.V.N. Schuyler, Deputy Director for Facilities Support, Directorate of Civil Engineering, HQ USAF, thanked the people from industry for making the conference successful. He called attention to dollar-stretching value of industry research and encouraged its continuance. He also expressed appreciation for the support of Deputies of Defense and that of other military organizations.

Ode E. Cox, Project Officer for the conference, was applauded for his behind-the-scenes handling of a wide range of conference production problems.

Tellurometer Expansion

A complete new plant for the testing and servicing of Tellurometer Systems has been announced by Tellurometer, Inc. The United States distributor of the electronic distance-determination system developed the laboratory to expand service to users of Tellurometer in this country. The present staff will be rapidly increased with electronics experts and specialists in various phases of Tellurometer maintenance and operation, the firm announces.

The address is: Tellurometer Service Center, 5451 Randolph Road, Rockville, Md., a suburb of Washington, D. C.

NEW JERSEY'S SAFETY ANSWER:

Still Higher Centerline Barrier

A foot of height added to already massive concrete barrier, as standard treatment for multi-lane pavements.

An improvement in centerline barrier design is announced by the New Jersey state highway department. High, concrete barriers are required in this state for separating opposing traffic on otherwise non-separated multi-lane highways. Some 66 miles of such barriers are now in use.

Installation of the modified barrier will be first made on a 1.6 mile section of Route US 46 in Bergen County. The new barrier will be higher and narrower than those now in use. The present standard center barrier is 20 in. high, 30 in. wide at its base with tapering concave sides that result in a 9 in. wide top surface.

● Although the present design has been nearly 100 percent successful in eliminating head-collisions on heavily traveled sections of Routes 4, 22, 46, 17 and 130, there have been infrequent freak accidents in which vehicles either hurdled or straddled the barrier.

In an attempt to reduce, or even eliminate, these instances, the barrier height is raised to 32 in., or a foot higher. Also concave side surfaces will be replaced by straight sloping sides to minimize the possibility of vehicles mounting the barrier.

The state highway department has spurred its construction of center barriers during the past five years as a means of eliminating head-on collisions on many undivided and over-burdened routes. Several types of barriers were experimentally installed early in the program, but the department had standardized on the 20 in. high solid concrete type.

It has become the backbone of the department's statewide program to build safety into otherwise outmoded highways, a program that included construction thus far of nearly 200 overpass bridges, more than 30 creeper lanes, and about 150 jug-handles to permit left turns to be made outside main highway traffic lanes.

According to a department spokesman, the original concrete center barrier was designed to cut the heavy toll in lives that was being taken regularly at several locations throughout the state by head-on collisions. On some routes where such accidents were prevalent, traffic volumes were more than 100 percent above design capacities and there either was no center island or an inadequate one. Construction of a new wide center island at such locations was usually stymied because of heavy development of adjacent roadsides that precluded possible major widening of the highway.

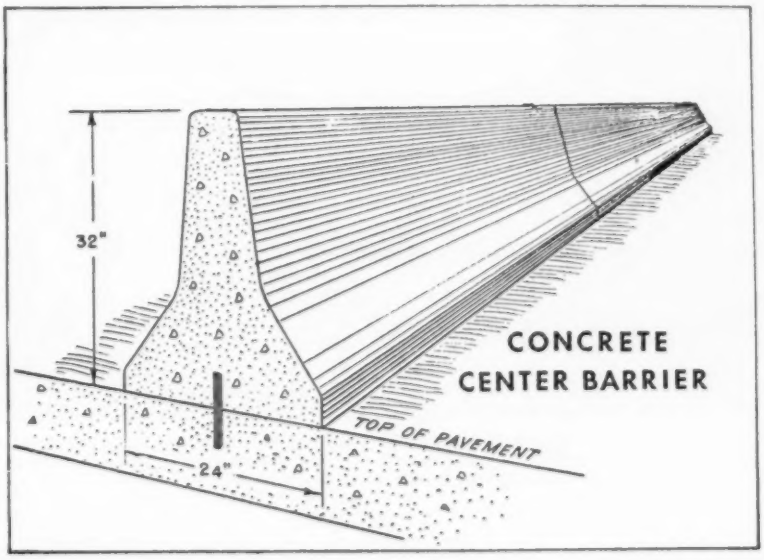
The department classes its barrier curb construction results as "dramatic" and cites the following examples:

1. On Route 4 in Englewood, carrying 48 to 50 thousand cars a day, there were 6 fatalities in the 33-month period preceding erection of the barrier. All were due to cars crossing the centerline. There has been one such fatality since April of 1955, completion date of the barrier construction. This is believed to have been caused by adjacent sloping curb—a design that has been discontinued since 1954, and an experimental divider since replaced.

2. In Hillside, where up to 59,000 cars a day traverse US 22, a total of 11 persons had died in the three-year period before erection of the barriers in 1954. There have been no deaths due to head-on collisions since then.

3. More than 2½ years have passed since erection of a centerline barrier on Route 4 in Teaneck. In this area, where 51,000 cars a day pass, there have been no head-on collisions reported during that period.

The department recently supplemented its statistics by polling police agencies that patrolled highways where the center barriers had been in use for some time. Of eight such agencies contacted, all were unanimous in stating that they felt the center barrier to be the greatest safety factor yet introduced on highways and that they saw no reason to believe the barrier had other than favorable effects on traffic and traffic handling.



● New Jersey contractors will be fixing their forms to build this new 32-inch-high barrier on numerous roads—the old model was 20 in. high.

Reinforced Concrete Pipe Chosen For

This 96" diameter reinforced concrete pipe easily met the rigid requirements of ASTM Specification C76-57T. Tests indicated this reinforced concrete pipe was capable of loads exceeding 100,000 pounds, demonstrating the strength and durability.

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Waukesha Cement Tile Company, Milwaukee, Wisconsin—Pipe Suppliers
American Vitrified Products Company, Milwaukee, Wisconsin—
Pipe Suppliers
Lock-Joint Pipe Company, South Beloit, Illinois—Pipe Suppliers

Richard I. Bong Air Force Base Runway Drainage

More than 48,000 linear feet of concrete pipe was included in the Corps of Engineers specifications for the Richard I. Bong Air Force Base at Kansasville, Wisconsin. Many sizes were required, the largest being 96″ inside diameter. All reinforced concrete pipe was manufactured and pre-tested to meet the rigid requirements of ASTM Specification C76-57T. The 96″ pipe was required to meet a loading test of 96,000 pounds. It met this requirement easily and could have withstood loads exceeding 100,000 pounds!

Reinforced concrete pipe is designed in conformance with specifications comprehending the laws of mechanics plus the results of thousands of tests; it is manufactured by men experienced with concrete product production; and it is pre-tested to demonstrate its strength. The pre-testing is done by means of the 3-edge bearing test which is the most severe loading to which the pipe will ever be subjected!

Reinforced concrete pipe installations, in service for many years, are testimony to the strength, durability and watertightness of concrete pipe reinforced with Welded Wire Fabric.

Concrete pipe manufacturers insist on top-quality reinforcing, meeting rigid specifications—that's why so many of them use American Welded Wire Fabric. This quality product, with its machine-made accuracy, assures the proper distribution of steel. It is prefabricated from cold-drawn, 60,000 psi yield strength wires. All intersections are electrically welded to assure mechanical anchorage in the concrete. Wire diameters as large as 0.505″ on 2″, 3″ or 4″ centers can be furnished. Its rigid specifications assure superior reinforcement.

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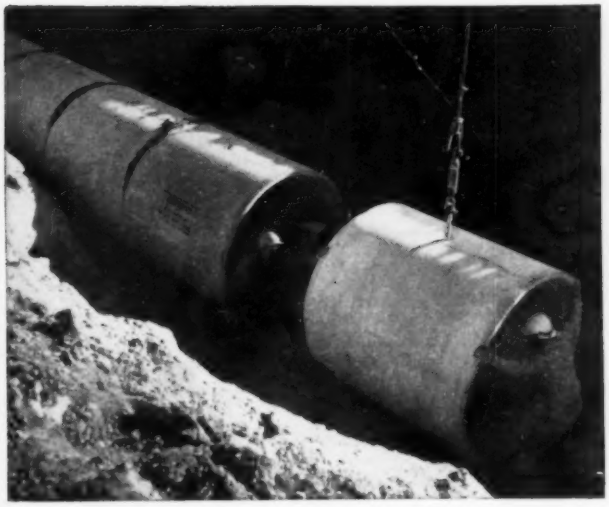

Sections of concrete pipe go in place more quickly and with no job interruptions. Its uniform size insures tight joints and proper alignment.

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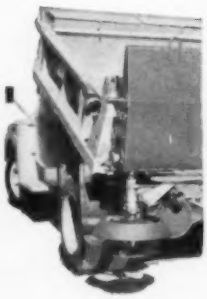
In addition to the STĀ-BILT Century Spreaders shown below, there is the SHY-34, a practical, low cost sealcoat unit which spreads a metered, clean margined mat 24 inches to 9 feet in width. Frequently the SHY-34 spreads chlorides in salt stabilization.

Then there's the Century HY-8, a low cost unit which is able to spread chlorides for ice control in extremely sparse amounts. It too, is popular in soil stabilization.

Except the hopper type Century JUNIOR

The Century HY-4 is highly versatile. Equipped with a spinner the HY-4 spreads sand or chips from 24 inches to 40 feet for ice control.

In summer for sealcoat work, the spinner on the HY-4 can quickly be replaced by the channeled tray (above). With the tray the HY-4 spreads sand, stone, chlorides (for soil stabilization) and all types of aggregates up to 1½ inches.



Century Model HY-4LCT has the spinner and circular deflector mounted at the left hand corner of truck body. This allows truck to travel in proper traffic lane and spread on center line for dispersion of materials by traffic.

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ASTM Theme:

Deeper Understanding of Materials

Highway materials were high on the agenda at the annual meeting of the American Society for Testing Materials. Following are notes on selected topics from this meeting, which was a focal point in technical advancement reaching into every branch of the highway building art.

A plea for less empiricism and a more fundamental approach to materials problems ran like a thread through many of the addresses and other activities at the 62nd Annual Meeting of the American Society for Testing Materials, held in Atlantic City, New Jersey, June 21-26, 1959. The ASTM gathering drew an all-time high registration of 3,133.

As president K. B. Woods (Purdue University, civil engineering head) said in his retiring-president's address, "solving the problems of materials will be the key to success in the broader problems introduced by the space age." Woods foresees a greater science-orientation in the engineering school curricula and in the engineering profession. He noted the accelerating pace of technological development, reviewed the gradual replacement of "craft" and "skill" courses by fundamental scientific courses in the engineering schools, and predicted that these two continuing trends would have great impact. "In my opinion," said president Woods, "engineering in all its branches has undergone more fundamental changes during the past seven or eight years than has occurred during the previous 30 years or so."

The retiring president concluded that ASTM must be prepared in the future to provide standards for many new materials, and to expand its membership.

● *Basic Knowledge of Highway Materials Needed.* Bituminous materials have been in use since the days of the Pharaohs—yet our knowledge of them is still mostly empirical. Thus did Ellis L. Armstrong, in his address at the convention's Highway Materials Luncheon, illustrate the need for more fundamental knowledge of all the materials used in the construction of highways. Mr. Armstrong, who is Commissioner of Public Roads, reminded that in our national highway program billions of dollars will be spent on materials alone. Continued research leading to new basic knowledge of these materials could effect tremendous savings. Mr. Armstrong hoped for the day when the highway engineer could specify the properties he needs, and the producer could proceed to turn out a tailor-made product to meet the need.

To some extent, he stated, this is now being done in the fields of plastics and petroleum products. With a greater fundamental knowledge of highway materials, the same might be possible in that field.

Organization of the Materials Science Division of the Society, called by president Woods "perhaps one of the most important additions to the scope of the Society since its inception," was furthered at the meeting of an advisory committee comprising some 25 men outstanding in their respective fields. This committee reached tentative agreement on the scope and activity of the new division.

Frank L. LaQue, International Nickel Company, was elected as the new ASTM president for a one-year term. Representing the construction industry, Dr. A. Allan Bates, vice president of research and development, Portland Cement Association, continues as vice president. A highway engineer, A. B. Cornthwaite, engineer of materials and tests, Virginia department of highways is among the directors elected.

● *Session on Concrete.* An appreciation of the broad aspects of concrete and its many characteristics and uses was gained from the two sessions devoted to this subject during the ASTM annual meeting in Atlantic City. Eight papers were given. Comments on three of these:

1. *Flyash* use in concrete has become widespread. This heterogeneous material, coming from the sources and conditions of burning, varies in its composition. L. J. Minnick, G. & W. H. Corson, Inc., Plymouth Meeting, Pa., presented comprehensive data on the basic properties and characteristics of this material. This study included chemical and physical tests based on X-ray diffraction and fluorescent spectrographic analysis, microscopic examination, and a few differential thermal analyses.

2. *Pore characteristics* of course aggregates and their influence on the freezing and thawing durability of concrete, is one of the newer fields of research receiving increased attention. W. L. Dolch, Purdue University, reviewed a study of simple fluid-flow measurements in an attempt to learn more about these characteristics. Density, porosity, absorption, degree of saturation, specific surface area, capillary absorptivity, permeability, and tortuosity factor determinations were made on four Indiana limestones with both good and poor field and laboratory durabilities. The author concluded that, for these materials and tests, the rate of increase of saturation when exposed to free water, and the ratio of the absorptivity to the permeability, are two useful indexes of frost susceptibility of the material when used as coarse aggregate.

3. *Excessive expansion* due to alkali-aggregate reaction has been of concern to the concrete industry, and has been the subject of much study and research. In a paper by Leonard Pepper and Bryant Mather, U.S. Army Engineer Water-

ways Experimental Station, presented by Mr. Mather, the authors reviewed an evaluation of 20 materials representing eight different classes of mineral admixtures using both chemical and mortar-bar test methods.

The materials tested included granulated blast-furnace slags, natural cement, flyash, natural volcanic glasses, calcined opaline shales, unclaimed diatomite, uncalcined quartz and glass. The researchers found that all of these materials will effectively reduce expansion if sufficient amounts are employed in the mixture. It was found that neither the reactivity with sodium hydroxide test, nor a modified method of this test, can be used with reliance. It was concluded that the present procedures in the Corps of Engineers Standards CRD-C 262 and 263 are satisfactory means of establishing the effectiveness of a material in preventing excessive expansion due to alkali-aggregate reaction.

Concrete Aggregate. Epoxy resins, radiation shielding, testing techniques for vibrated concrete, and standards on lightweight concrete were the subjects prominently discussed at the meeting of Committee C-9 on Concrete and Concrete Aggregates, held June 24, during the ASTM annual meeting, in Atlantic City. These are the newer subjects of consideration and represent the latest developments in the broad field of concrete.

The growing use of epoxy resins has led to serious study by an *ad hoc* subcommittee as to the proper coverage of standards in Committee C-9. Standards for concrete for radiation shielding in nuclear installations are now the responsibility of a working subcommittee under the chairmanship of Milos Polivka, University of California. Assignments were made to a number of task groups to develop performance requirements for various factors involved. A test program will be conducted to verify a proposed procedure for vibration of concrete testing cylinders. Standards have been limited to date to lightweight aggregates as used in concrete. The need has now been expressed for additional standards to evaluate lightweight concrete. A survey will be made to establish the applicability of existing ASTM methods to lightweight concrete.

WINTER MAINTENANCE

(Continued from page 103)

theory works out much as predicted, turnpike engineers say.

Stockpiling of chemicals has been given some new wrinkles in Ohio, too. Turnpike engineers store their materials out-of-doors, without cover except for tarpaulins; even calcium chloride and the pre-mixed salt and calcium chloride "hot" mix, which are protected by tarpaulins. (Calcium chloride stockpiles rest on bituminous pads, to prevent loss from ground water.)

● Stockpiles are strategically located along the route of the turnpike at division and section shops, and at other intermediate points. Supplies at the shops include: one pile of abrasives; two 200-ton salt piles; one 50-ton calcium chloride pile; and two 40-ton piles of salt-calcium chloride "hot" mix.

The stockpiles at intermediate sites include one pile of abrasives, two 100-ton salt piles, and one 30-ton mixture of salt and calcium chloride.

Substantial savings can be realized by pre-season purchasing such materials in bulk, officials have found out, and only an insignificant amount is lost from caking. Chemicals are obtained under open end contracts with the lowest bidder and delivered as needed to the specified locations throughout the winter season. Thus, the organization avoids the high cost of inside storage.

● Maintenance crews also serve as firemen—another off-feat job that falls to an organization operating a limited-access highway isolated from local fire fighting services. Fires are frequent; these specially designed trailers get a real workout.

● One of the Ohio Turnpike Commission's well-equipped tool rooms, part of set-up at each of eight section shops.

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MORE WESTERN CONFERENCE NOTES

Additional notes on the WASHO conference held at Billings, Montana, June 22-26. The first part of this article was published in the August, 1959 issue of Roads and Streets.

The trend toward end-results specifications was easily discernable in papers on various subjects given at WASHO's recent annual meeting. The discussions in the Material and the Construction sessions took it almost for granted that the contractor would be allowed to use his ingenuity to the fullest possible extent wherever the end-result could be readily evaluated. The engineer's problem: adequate and rapid test methods.

William J. Walsh, staff construction engineer for the Colorado department of highways, presented the only formal paper on the subject. (See Walsh's report on the subject in Roads and Streets, March, 1959.) Walsh summed up his paper as follows:

"By way of winding this thing up, we might say that an end-result specification, as far as Colorado is concerned, is a policy rather than an actual practice; that is, in a complete sense. There are situations under which it is neither desirable nor practical to just spell out an end-product. Such a practice, if carried to the extreme, could work a considerable hardship on our contractors, and might prove uneconomical. But, if we have the desire, this policy will work, and specification writing should always leave the door open for the admission of the very latest innovations in equipment and ideas."

"We can say without too much fear of contradiction that our contractors favor the policy, and for our own part we find it works very well."

● *Compaction Specifications.* E. C. Simpson, construction engineer, Washington department of highways, presented to the Construction session a paper entitled, "Control of Embankment Compaction" which dealt largely with Washington's adoption of end-result specifications for all embankments.

In discussing Washington's efforts to revise roller equipment specification he stated, in part; ". . . This involved seventeen different general specifications ranging from the large 50-ton pneumatic super compactor to the flat-plate gang type vibratory compactor. During the writing of these specifications, several revisions were made to include newly developed compactors, and effort was made to anticipate other new developments. However, before the new specifications could be printed several new satisfactory units were marketed which would have been restricted by the specifications. It was concluded that suitable equipment specifications could not be written which would not discriminate against new developments, and further such effort was abandoned. This decision was influenced largely by the rapid progress being made in developing the necessary control tests which would permit the use of an 'end-product' specification."

● *Materials Testing.* Stimulated by the dynamic influence of chairman F. N. Hveem, materials and research engineer, California, the session on Materials took a long-range look at existing and proposed test methods.

L. F. Erickson, materials engineer, Idaho department of highways, reporting on "Material Control on Construction," pointed out the personnel problem occasioned by the great increase in the dollar volume of work. He felt that most of the new devices available for testing will be of little assistance as they are now too expensive to be considered for placement on construction projects. The Idaho department has furnished each of its district offices with one Washington Dens-O-Meter and has found them to be excellent for granular materials. Erickson said Idaho still uses the sand density test for other embankments. Putting 46 fully equipped laboratory trailers in the field has greatly facilitated Idaho testing.

Erickson outlined the following general principles which Idaho engineers are using to utilize their inspection personnel with the greatest possible efficiency: (1). Recognize testing as a tool; not an end in itself. (2). Train inspectors to rely more upon a combination of testing and observation to allow a greater percentage of their time to be spent in actual job control. (3). Inspect and sample as much material as possible at the point of fabrication or production. (4). Eliminate payment for rolling, but retain payment for water. (5). Furnish, as part of the special provisions, all available information regarding a source of material. (6). Permit the contractor to substitute an equally good source if he so desires.

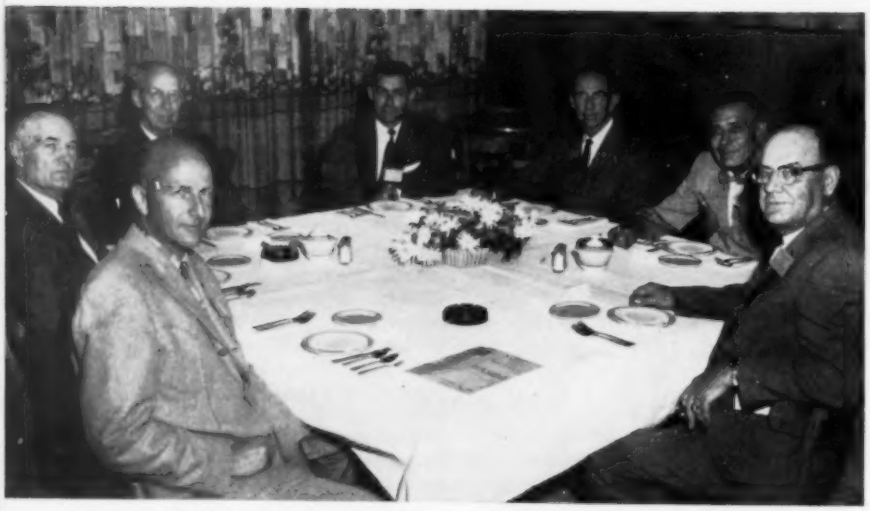
Random comments during the discussion of Erickson's paper: F. N. Hveem of California voiced skepticism of the Chicago Nuclear test, pointing out that it has been the subject of inconclusive research for a number of years and is expensive ($4,000 to $5,000 for a complete set). Hveem also commented that the present equipment using carbide in determning moisture content involves a sample too small for the required accuracy.

Erickson commented favorably on Idaho's use of the sand-equivalent test.

Replying to a question as to the degree to which an embankment retained its high compaction, Hveem cited California's experience showing that the high density gradually dissapates unless the embankment is loaded sufficiently to retain it.

Erickson reported several instances of crushed basalt degrading after being incorporated in the pavement, but was at a loss to explain its occurance. At this point Hveem commented that the Los Angeles Rattler test may well be "on its way out," as not being a true indication of hardness in all instances.

All of the papers at this session emphasized the need to improve methods for rapid testing. Of similar importance was the training of personnel to be able to exercise good judgement in the job control resulting from the tests.



● **WASHO's executive board meets at Billings. (Around table from nearest left): T. D. Sherard (Wyoming), secretary-treasurer; R. C. Rich (Idaho); C. E. Waite (California); C. Taylor Burton (Utah); W. E. Willey (Arizona); W. C. Williams (Oregon), retiring president; Fred Quinnell, Jr. (Montana), conference chairman.**

● **Alf Johnson, executive secretary of AASHO in Washington, D. C., addressing the Billings conference.**

● *Contractors Speak Up.* W. Ray Rogers of A.G.C., spoke forthrightly in a luncheon talk on "Road Construction—The Bargain Basement of Large Industries." He credited the contractor's large investment in plant and equipment as the greatest single factor in keeping prices construction at their current low level. Rogers cited instances where the unit dollar prices for construction have actually gone down over the years. He expressed the opinion that rising labor rates will bring either an increasing degree of automation or rising construction prices.

Rogers pictured the contractors as being highly in favor of modified end-result specifications coupled with lump-sum bidding. He made an urgent plea for the adoption of uniform specifications, nation wide, to be applied to every possible item. He urged the engineers to do everything possible to assist the industry in keeping future costs at a minimum; stating that the public will want a good value for their highway tax dollar.

Rogers laid great emphasis on the teamwork which must exist between the engineers and contractors to keep costs down. He felt that both sides have problems in their relationships one with the other. He could see no reason for any militant attitude toward contractors on the part of engineers. Rogers called attention to the fact that a contractor is in a select group if he can even come out with 1½ to 2 percent profit after taxes. He feels that part of the trouble on both sides stems from the employment of younger people lacking mature judgment.

Rogers said that it was difficult for contractors to see why engineers insist upon a retained percentage while at the same time requiring rigid bonding. He feels that the practice of retaining a percentage of each estimate, plus slow pay, is a costly procedure and responsible for breaking many contractors. He called for faster processing of estimates and change orders as mandatory in keeping construction costs down.

Other steps which Rogers favored were: state acquisition of pits and rights-of-way; a minimum of three weeks advance advertisement of projects; the setting of stakes well in advance of the contractors needs; and careful planning to enable the traveling public to be inconvenienced as little as possible by construction.

● *Electronics and Photogrammetry.* The fast growing role of the electronic computer and photogrammetry, as tools for the efficient use of engineering personnel, was attested to by the nine papers in this area given at Billings. The applications discussed covered highway location and design, bridge analysis, design of short bridges and interchange structures, right-of-way areas, and the combined use of photogrammetry and electronic computers.

William F. Dillon, Bureau of Public Roads, Office of Operations, in reviewing "The National Picture of Electronics in the Highway Program", concluded his talk with a prediction that the use of electronic devices will grow. He credited them with being a large factor in keeping the highway program on schedule and feels confident that this role will become increasingly important.

● *Public Relations.* The value of public relations, both as applied to the taxpayer and within the highway industry, was an underlying theme of the Billings meeting. It was evident that highway officials are becoming increasingly aware that they are now in the big leagues and must consider a far wider range of spectators than in the days before the Interstate System. All of the many papers dealing with public relations took cognizance of the fact that continuing appropriations will be largely dependent upon a "vociferously demonstrated supporting public opinion." Several state highway department spokesmen reported in detail on the great lengths to which they have gone to keep the public informed on what they are doing, what they plan to do and why they have to do things as they do.

Highway officials are also recognizing that their own employees are the ones most likely to be responsible for moulding public opinion. The result has been to embark on employee training, aimed at making even the lowest paid employee a highway-program salesman. Another aim is to insure good relations within the highway department so as to secure, and keep, well qualified personnel.

Employee Labor Bribes

CHARGED with accepting $200 from their employers to buy labor peace two employees of a Pennsylvania paving company and members of a local of the International Hod Carriers, Building and Common Laborers Union were convicted in a federal court in Pennsylvania of a violation of the Labor Management Relations Act.

By that statute it is provided, "It shall be unlawful for any employer to pay, or agree to pay or deliver, any money or other thing of value to any representative of any of his employees who are employed in an industry affecting commerce.

"It shall be unlawful for any representative of any employees who are employed in an industry affecting commerce to receive or accept or to agree to receive or accept from the employer of such employees any money or other thing of value."

Here the employers, the Black Top Company, had contracted with the Pennsylvania Department of Highways to widen and resurface Pennsylvania Route 71. At the time this payment was made work on this project had been temporarily stopped on account of weather. Nevertheless these contractors maintained contact with the workmen for their return to the job when work was resumed.

● Also in the contract between the employers and the Laborers' District Counsel workmen who left this employment during the duration of the employment in the performance of this contract had agreed not to accept employment with any other heavy construction or highway contractor without the consent of this employer.

From their conviction these employees appealed, contending that this payment had been made during a work stoppage in the winter when this contracting firm had no employees and that these men were not representatives of the employees within the meaning of the statute.

Of the argument that these payments were not made at a time when this firm had employees, the Federal Appellate Court said, "There are plenty of decisions that show because a man is not at work at a particular day he does not necessarily lose his rights as an employee. The laborers who could not work because the weather was bad were subject to call in the sense that they kept in touch with the employer to see whether work could be resumed."

● As authority for holding this work stoppage did not terminate the relationship here of employer and employee the court referred to a case involving similar circumstances before a federal court in California. There it had been stated as the law that, "This shutdown and layoff was no more than a suspension of work. It was not a termination of work. It was in accordance with long established custom.

"The relation of employer and employee does not always depend upon continued actual everyday work. In the instant suspension of actual operation the employees of long standing and experience were "laid off" until work is resumed."

Of the controversy over the interpretation of the phrase in this statute, "representatives of any employees," and the insistence by these men that they could not be so characterized, reference was made by the court in its refusal to adopt this conclusion, to a recent decision by the United States Supreme Court sustaining the conviction of a one time president of the International Longshoremen's Association under this provision of the statute in a prosecution in which this same defense had been made.

● Over a period of six years the head of a stevedoring firm had each Christmas paid this man $1,000, in some instances the currency enclosed in an envelope endorsed, "Merry Christmas." By the trial court in holding such payments were violations of this law it was said of the contention that "representative of any employees" referred only to collective bargaining agents.

"The inference is a farfetched one." In my opinion a willful violation of this section is proved if it is shown that a 'representative' of any employees who are employed in an industry affecting commerce receive or accept any money from the employer of such employees with knowledge (1) that he was receiving and accepting money and (2) that the person who was giving him the money was an employer of employees that he represented."

● When a year later this conviction, six months imprisonment and a fine of $2,500, was sustained by the Supreme Court, it was said of this contention,

"It is obvious that any labor organization even one serving as an exclusive bargaining representative, can negotiate, speak and act only through individuals. All collective bargaining is conducted by individuals who represent labor and management.

"Many limitations or prohibitions upon labor organization action can be effective only if there are corresponding limitations or prohibitions on the individuals who act for the labor organization. Congress, we believe, placed the identical limitations on both individuals and organizations by terming both 'representatives' of employees. We agree that in using the term 'representative' Congress intended that it include any person authorized by the employees to act for them in dealings with their employers."

REFERENCES

29 U.S.C.A., section 186 (a), (b)

United States v. Pecora, (C.C.H.) 37 Lab. Cas. 66,601, Pennsylvania May 19, 1959

North Whittier Heights Citrus Ass'n. v. N.L.R.B., 109 F.2d 76, January 12, 1940

United States v. Ryan, 350 U. S. 299, February 27, 1956

With safety flag flying, 3-wheel A-W roller "takes-off" as it resurfaces new jet runway at Philadelphia International Airport.

Austin-Western 3-wheel roller speeds resurfacing at Philadelphia Airport

The contract called for resurfacing 5800 ft. of runway, 150 ft. wide, at the Philadelphia International Airport. Contractor James J. Skelly, Media, Pa., chose an Austin-Western 3-wheel 10-14 ton roller to lay the required 1-in. wearing surface over a 2-in. base of bituminous concrete.

Well pleased with A-W

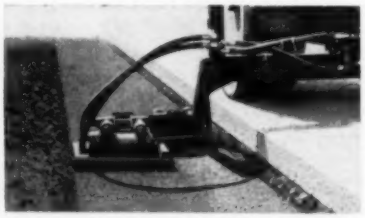
Mr. Skelly says, "I'm well pleased with the Austin-Western roller. It's more compact than most competitive rollers —easier to handle and gives the operator better visibility. Its V-8 engine delivers plenty of power, permitting the A-W roller to keep pace with the average daily output of 1600 tons of asphalt paving from two machines. There have been no maintenance problems. The A-W is an excellent roller—ideal for a progressive paving organization!"

Exclusive A-W features include hydraulic steering, full-width seats that let operators sit to right or left for better visibility; long-life oversize axles and antifriction bearings; many interchangeable parts; beveled outside roller edges that won't mark hot materials.

A-W 3-wheel rollers available in 8 to 11, 10 to 12, 12 to 14-ton models; tandems in 5 to 8, 8 to 12, 10 to 14-ton models. Portable tandem variable between 3½ to 6 tons. A-W vibratory Roller-Compactor unit fits any make 3-wheel roller; vibratory widener attachment also available.

A-W for profit

No matter what your compaction requirements, there's an Austin-Western roller to profitably meet your needs. Investigate! Consult your nearby Austin-Western distributor or write direct.



Vibratory widener attachment—for use with any 3-wheel roller equipped with A-W Roller-Compactor unit . . . may be mounted left or right.

Austin 100th YEAR Western
CONSTRUCTION EQUIPMENT DIVISION, AURORA, ILL.
BALDWIN · LIMA · HAMILTON
Power graders • Motor sweepers • Road rollers • Hydraulic cranes

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Davis-Bacon Act vs. Truck Drivers

The employment of trucks and drivers on an Interstate project which comes under the Davis-Bacon Act often poses a problem as to the coverage of the driver.

So notes a bulletin from the Virginia Road Builders Association, which observes that, though the truck may be driven by its owner, if it is hired by the contractor the driver comes under the wage scale.

If the contractor purchases stone from a commercial quarry, the stone producer may deliver it to the job site and discharge the contents of his vehicle into the contractor's stone spreader without becoming involved in the Davis-Bacon coverage. If, however, the contractor hires the trucks and hauls the stone to the job site the truck driver is covered and must be paid the minimum wage specified in the contract.

There is quite a difference when we consider the wage-hour coverage under the Fair Labor Standards Act and the liability for employment taxes. These obligations spring entirely from an employer-employee relationship. One of the tests which is generally applied to determine the tax liability and compliance with the wage hour law is the degree of direction and control exercised over the individual worker. Under normal circumstances it is probably safer for the average contractor to contract with one trucker and transmit all of his instructions through him.

There are many decisions on the question of responsibility and, if you have a case which is borderline, it is well to get a decision on it before incurring any penalties.

Heldenfels Has Attractive 50-Year Booklet

Heldenfels Brothers, central contractors, Corpus Christi, Texas, are celebrating their 50th anniversary among other things by the issuance of a very attractive pictorial booklet on the firm's accomplishments and facilities.

This booklet names typical outstanding projects which the firm has built recently, outlines the materials production facilities of the company, which include sand and gravel and other plants; gives a historical sketch; shows pictures of the chief personalities and their biographical data, etc.

Fred W. Heldenfels, Jr., one of the firm's leaders, was national president of the Associated General Contractors of America in 1958.

Ohio Road Firms Warned on Slowness

Eighty-two contractors were warned by the Ohio state highway department to step up production, or lose their qualifications to participate in future bidding on state projects. State highway director Everett S. Preston stressed the warning in telegrams to the firms which hold $125 million in contracts on 134 new construction projects.

"Your attention is called to the fact," Preston said, "that your ability to prosecute the work you now have under contract must necessarily be taken into consideration when determining the amount of your pre-qualification for future contracts."

The job of speeding up the lagging contractors was given to C. W. McCaughey, deputy director in charge of design and construction. He said the state would not be able to open the North-South Freeway between Columbus and Medina, and Painesville and Conneaut, by the Nov. 30 completion target, unless work was speeded up. "That is the longest stretch of new construction we have under contract," he said.

Some of the contractors, he continued, have taken an uncooperative attitude in their efforts to overcome time losses caused by a 15-day operator's strike, January's floods, and a rainy 1958 construction season. He said while some contractors have rented additional equipment and were working double shifts to meet completion deadlines, others have taken a "lackadaisical" attitude and were making no attempts to finish on time.

"Prestressed" Convention

The fifth annual convention and meeting of the Prestressed Concrete Institute will be held November 1-7, at the Deauville Hotel in Miami Beach, Florida.

An estimated 900 delegates, U. S. and foreign, are expected to attend. The convention will cover all phases of research, production and application here and abroad. A three-day, post-convention field trip to Havana will see examples of prestressed concrete in that country.

Co-Chairmen of this year's convention committee are: Douglas P. Cone, Ashton Gray and George W. Ford, all past presidents of PCI. Charles C. Zollman and A. H. Gustaferro are in charge of the technical program. Convention headquarters is located at 3132 N.E. Ninth Street, Fort Lauderdale, Florida.

Contractor Builds Batch Plant For Subbing Bridge Pours

A small-investment portable batcher helped this contractor low-bid a profitable piece of subcontracting for highway bridges.

Portable batch plants for highway bridge concreting are getting much consideration these days. A contractor in Washington state recently has used a plant built to his own set of ideas. The plant was given its first on-the-job test in July by DeAtley Paving & Crushing Inc., a family-owned concrete film at Yakima, Washington.

The initial test was a severe one, preparing the concrete for three bridges on a state highway project that also meets federal standards for probable inclusion on the Interstate system. Its heaviest schedule was for a 600 cu. yd. pour in a single day.

The plant was designed specifically for this job which involved $40,000 worth of bridge concrete. To Leland DeAtley, who serves as secretary-treasurer of the organization and who designed the rig, its construction was the only way in which the firm could bid on the project. It was built by Paul Ray, of Mobile Welding Service at Goldendale, Washington, modifying an existing design.

Ray spent two weeks fashioning the bins and framing. An equal amount of time was needed to mount the motors and gauges. With the modifications and enlargements this compact plant has a production capacity nearly double that of the ordinary small portable rig.

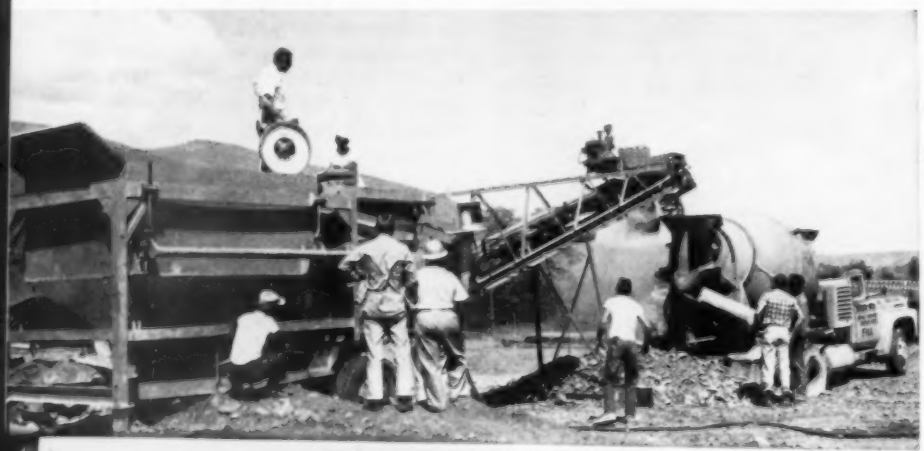
Thirty-inch wide belts and a larger hopper and power unit combine, in combination with a truck mixer, to produce finished concrete, the first batch ready in about 6½ minutes after starting the motor. The machine works from stockpiles located at a bridge site.

The high standards of the Washington state highway department are being met without any trouble. Bernard F. (Bud) Hansen, resident engineer on the job, said the concrete is meeting all specifications.

Only one truck mixer was used, one of the major savings behind the low-job bid. Also, the plant cost substantially less than ordinarily expected for such an outfit.

On the small pour, DeAtley figures he saves for other use at least two trucks. On a large pour, three or four are freed for other projects compared with hauls from the firm's fixed plant location.

● The plant can be moved with a few minutes' preparation. Stilt-like legs are pulled up to the frame and



(Top of Page): Two men hand fill cement hopper from back end of trailer. Below is seen meter and hose for measuring water into truck mixer drum. Glimpsed (above right) is bucket and gauge of air entraining agent.

(Left): A good view of the full operation of DeAtley's portable batch plant. The weighing hopper (with dial scale on top) has a flat board angled into it to prevent spillage from the loader bucket.

fastened, four bolts holding the scale in position are tightened, and the hose which carries the water for concrete mixing is unhooked.

The concrete conveyor is then used as the tongue when moving, and it fits on any type of rig. The 40-foot-long plant is then on wheels and rolling down the highway. An 8-ft. axle on the rear, below the weighing hopper, adds stability for the road.

During the summer weeks the plant was moved twice, once from Goldendale to Yakima—a 70-mile trip—and then from the firm's stationary plant to the job site. Only two men are needed to operate the plant.

The plant appears particularly advantageous for mountain structure projects. In fact, since its first operation, the DeAtley firm has been approached on several occasions for just that type of job.

Because it is near the scene of the construction, other advantages include immediate production of a little extra concrete not originally thought needed; assurance to contractors of a fresh mixture; accessibility of the machine to inspectors who can be near the construction as well; and better coordination of work with the contractor.

One month of experimentation was needed before the batch plant was perfected. A few minor bugs had to be corrected on the job but these appeared to be no challenge.

Because electricity is not always available, the batch plant utilizes an 11-hp gasoline engine for its power. It could be adapted to electrical power by converting the motor.

Right now, DeAtley utilizes hand loading by the bag of cement. The entire process could be speeded up and less manpower used by bulk cement loading. DeAtley plans to do just that eventually. He figures the switch could be completed with the addition of a silo, auger and scale on the cement hopper.

The batch plant produces dry batch ingredients for 6 cu. yd. at a time via a 35-ft. belt into the mixer. It takes about 3½ minutes to prepare for production, another 1½ minutes during the cycle and for loading into the truck mixer's drum, and 5 minutes of truck mixing. For a normal pour, the plant can mix 50 cu. yd. an hour but can make a 60 to 70 cu. yd. rate on shorter pours.

DeAtley uses two trucks to haul the sand and gravel to the stockpile at the construction scene, but only when they are free from other organization business. The convenience stockpiling also spells savings. Water is supplied by pump directly into the truck mixer from an acceptable stream source whenever possible.

● **Loader feeds stockpiled aggregates into weighing hopper, inspector (at right) checking on the operation. Stilt legs seen under the conveyor fold when readying unit for a move-out.**

● Because the plant is so near the pouring site, if the mixture is found by the state inspector to be incorrect, the ingredient quantities can be adjusted in a few minutes. To produce concrete, water is pumped into the truck drum first. A Michigan loader then dumps sand and gravel into the weighing hopper with each aggregate weighed out with a dial scale to supply the specified amount.

Cement is dumped and weighed "by the bag" without a scale, using one or two men (the loader operator sometimes doubles as second man). Air entraining agent is supplied from a container and gauge.

The best feature of this outfit according to DeAtley is its help in coordinating the job. Once, on this initial 3-bridge project, after all the concrete ordered was produced, the prime contractor found he was one-half to three-quarters of a yard short. It was near quitting time.

The portable batch plant, always available at the site, came into play and the concrete was ready for pouring within 15 minutes. It saved an hour in overtime payments for the contractor.

Expressways Explained in Educational Pamphlets

The Michigan Good Roads Federation recently authorized the printing of several thousand copies of two brochures which depict the safety and economic benefits of expressway type highways. One of the brochures, small and general in nature, is entitled "How Michigan's New Expressways Help *You*!" The other is larger and in detail.

To distribute the small brochure a method dubbed "Operation Pass On" was recommended. Copies of the small pamphlet are being forwarded to a limited number of responsible persons throughout Michigan. They are asked to keep one copy and pass on the rest to other interested people.

The more detailed brochure will be furnished to any person, free of charge, on request to the Federation at 614 Michigan National Tower, Lansing 8, Michigan.

Two Contractors Break Concrete Paving Record

During the summer months two contractors each reported a one-day pour of 24-foot-wide concrete pavement slab exceeding the record set in 1958 by Denton Construction Co., of Detroit. As Roads and Streets reported in a project review in November, 1958, Denton's crew placed 6,029 ft.

The first of two new marks was that of Pierson Contracting Co., of Saginaw, Michigan, which reported a 6,050-ft. day's placement of 24′ x 9″ slab. The job was on US 12 in Berien County, Michigan. The crew reportedly worked from 6 am. to 6 pm. to edge over the old mark.

Soon following this announcement, Koss Construction Co., with headquarters in Des Moines, Iowa, chalked up a 6,067-ft. day's run, on the firm's job in I-70 between Junction City and Abilene, Kansas. This stint took 12½ hours (using three pavers, as with the other firms).

Then late in August Pierson recaptured the crown with a 6,242 ft. run of 24′ x 9″ slab in a 12-hour day on the US 12 Michigan project.

Tested and proved at some of America's

Best defense against pavement distress

...plus high skid resistance, too!

GUARDKOTE* 140

Want to cut down pavement maintenance expense in traffic trouble areas? Apply Guardkote 140 on bridges, at approaches to toll booths, ramps, tunnels, intersections, and cloverleafs. Guardkote 140 cuts maintenance costs by arresting spalling, scaling, and polishing.

Guardkote 140 is now giving outstanding service in more than twenty applications under a wide variety of conditions. Most of these applications are *north* of the frost line . . . testifying that Guardkote 140 withstands freeze-thaw cycling.

Guardkote 140 is a new liquid plastic paving cement, based on Epon® resin, which hardens within hours to a tough and flexible material. Its excellent adhesion permits the bonding of grit or aggregate to Portland cement and bituminous concrete, wood or steel substrates to give a skid-resistant protective wearing surface. Because of its low shrinkage, Guardkote 140 also is ideally suited for making durable pothole patches.

Easy to apply, either by hand or with available continuous spray equipment, Guardkote 140 forms a thin, impervious layer that seals concrete paving materials against the ravages of de-icing chemicals and freeze-thaw cycling and prevents rusting out of steel reinforcing material.

Read the list of advantages that Guardkote 140 offers, and you'll agree that it is among the most important new paving materials ever developed—

1. LIGHT WEIGHT—Because Guardkote 140 can be applied in thin layers, it is ideal for surfacing bridges. Gutters, expansion joints, and scuppers do not have to be raised. On new construction, considerable savings in structural design can be realized because provisions for heavier conventional resurfacing materials are not required.

2. FAST CURING—In warm weather Guardkote 140 hardens rapidly, keeping traffic interruption to a minimum—a matter of hours, not days.

3. EASE OF APPLICATION—Depending upon the area, Guardkote 140 can be easily applied in batches—by continuous hand spray or with labor-saving automatic tank truck spray equipment. Hot rolling and complicated form construction are unnecessary.

4. SKID-RESISTANT—Sharp grit or aggregate, applied before Guardkote 140 hardens, gives an excellent and long-wearing skid-resistant surface, even when wet or oily.

5. EXCELLENT ADHESION IN VERY THIN LAYERS—A 1/16" to ⅛" layer of Guardkote 140 develops bond strengths equal or superior to that of conventional paving materials to which it is applied.

6. UNHARMED BY OIL, GAS AND CHEMICALS—Typical of all Epon resin-based compounds, Guardkote 140 is chemically inert to all solvents and chemicals normally encountered on roadways.

7. LIGHT-COLORED GUARDKOTE 120—For matching the color of concrete, clear Guardkote 120 is available.

*TRADEMARK SHELL CHEMICAL CORPORATION

New BROS Roller... See how you can benefit by these 15 improved features

NEW EASE AND SPEED FOR BASE AND SURFACE COMPACTION

Big news about the new 3 to 10 ton BROS SP-54B.

A new "Velvet Drive" hydraulic reversing transmission provides sure, effortless control for back-and-forth rolling. Automotive type hydraulic power steering and short turning radius make turn-arounds easy—even on city streets.

Especially important, horse-power is correctly matched to job needs, keeping your fuel costs and engine maintenance to the minimum. Yet it provides the extra draw bar pull to tow a second roller on base and grade work.

A 40 gal. gas tank keeps the SP-54B working a full shift without refueling stops. High travel speeds to 20 MPH cuts time traveling between rolling jobs.

Full oscillation of drive wheel pairs "kneads" fill, base and surface materials, producing a tight, uniform mass. This action eliminates air and moisture voids, preventing possible frost heaves and entrained moisture. New 60% oversize high capacity Timken wheel bearings are mounted on husky, high-strength axles. A special triple groove steel labyrinth type seal and triple lip synthetic grease seal keep dirt and grit out.

Parking brake on drive shaft and individual service brakes on all 4 drive wheels add 95% more brake capacity . . . adding a greater margin of operator safety and control.

OTHER SP-54B FEATURES INCLUDE:

Torque converter drive . . . Direct connection of steering ram to front bolster . . . Lower center of gravity and lower silhouette . . . Easy access to drive train . . . New plastic scrapers to prevent tire pick-up . . . 100% coverage by ½ in. tire overlap.

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Write today for a new 8-page catalog which fully describes the SP-54B. It's free of cost or obligation!

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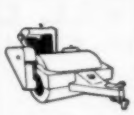
30-TON SELF-PROPELLED ROLLER



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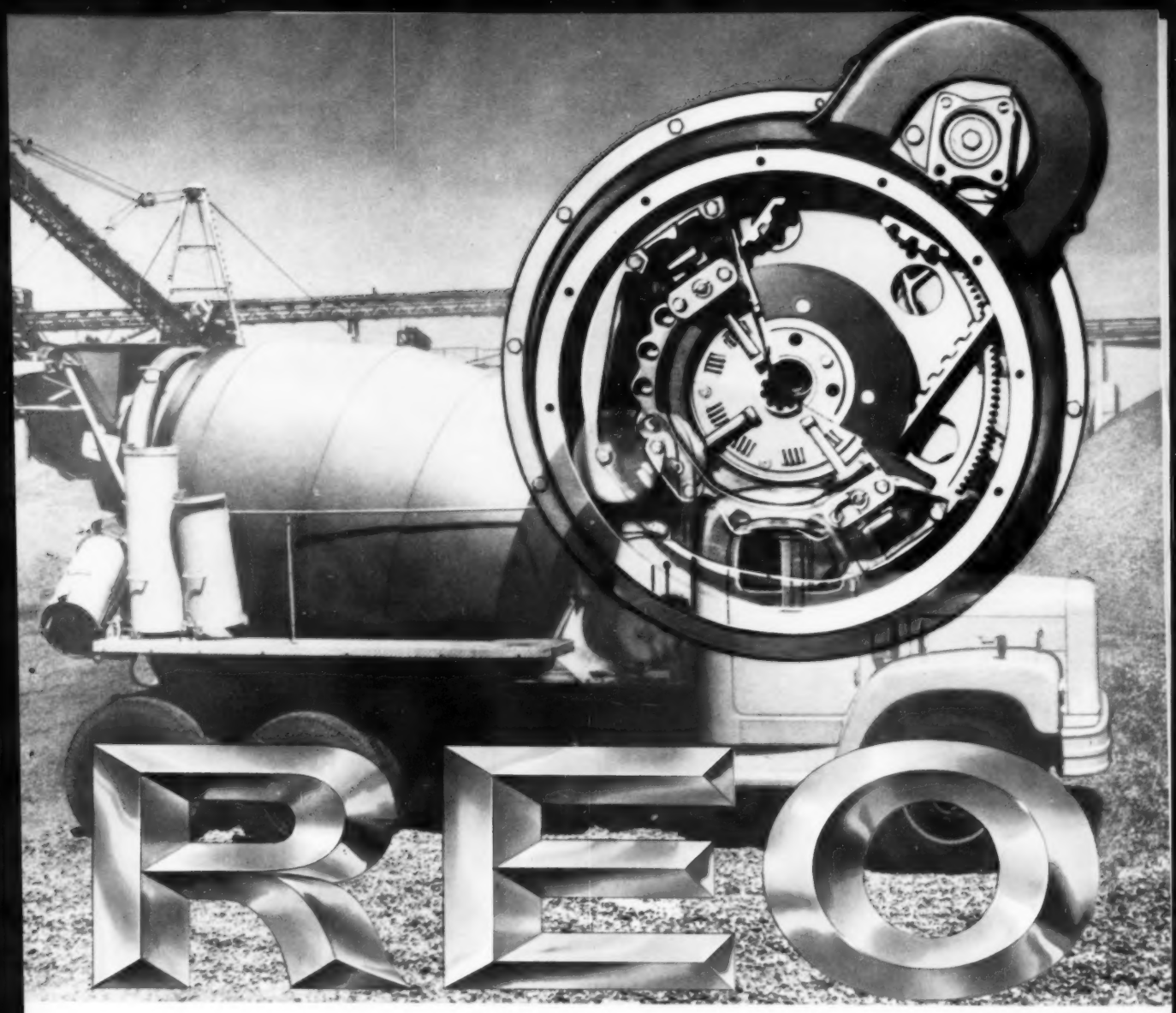
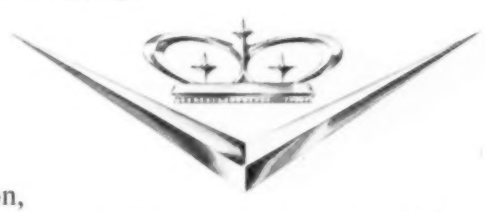


Reo's revolutionary new Flywheel P.T.O. brings to transit mix operators a "*bonus*" *payload increase from 400 to 600 lbs. per trip*— actual weight savings in a 6½ cu. yd. mixer unit resulting from the elimination of separate engine power.

Also eliminated are the headaches of separate service and maintenance requirements.

Reo engineered and installed as an integral part of the chassis engine drive, the Reo Flywheel P.T.O. supplies the mixer with a lighter and more efficient new source of power—smooth . . . even flowing . . . direct.

Most important, operators can have the "bonus" payload advantage of Reo's new P.T.O. at a low initial cost of equipment. Now available in Reo's rugged "C" Series line of transit-mix trucks. Another product of Reo's creative engineering skill has been added to the many important values found only in Reo Trucks. Reo Division, The White Motor Company, Lansing, Michigan.



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Compton Auger Cutting a 30-in. Hole and Installing Steel Pipe through 57-ft. of Solid Rock Beneath a Highway near Wilkes-Barre, Pennsylvania. This job was reported as completed in less than 8 hours time.

Earth and Rock Auger

A horizontal auger, capable of boring through solid rock formations and installing pipe up to 48 in. in diameter as it bores, has been introduced by Compton, Inc., a West Virginia mining equipment manufacturer. In this large size, it is said to be practically operable to a length of 125 ft. or more.

The patented cutting head consists of a series of saw-teeth with carbon steel tips. The machine is powered by a 75-hp engine with direct gear drive and hydraulic feed. It weighs approximately 9500 lb.

Compton, Inc., Clarksburg, W. Va.

For more details circle 101 on Enclosed Return Postal Card.

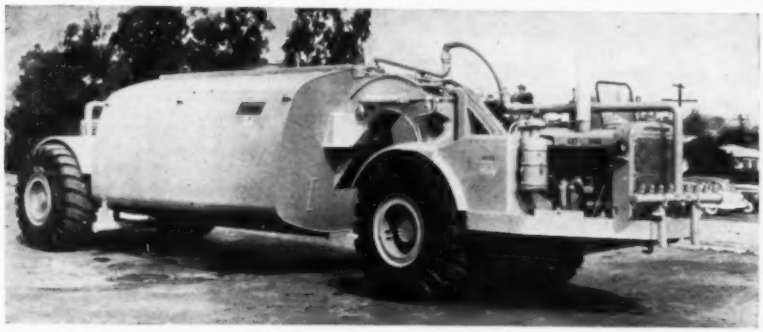
Semi-Trailer Sprinkler Tank

A new Model STT-80 Semi-Trailer Sprinkler Tank announced by Southwest Welding & Manufacturing Division has an 8,000-gal. tank capacity, with front, rear and gravity spray bars, which are capable of delivering 1,500 GPM with a spray swath of 55 ft. Nozzles on front and rear pressure bars are manually adjustable for regulating direction of spray and volume of flow. Flow control is from the driver's position. Duck-bill type spray pots are also available.

Two loading systems are offered: either from an overhead standpipe through a top inlet, or by a suction valve arrangement. Large earth-mover tires provide adequate flotation for operation in soft earthfills. The STT-80 is designed for use behind Caterpillar DW-21 and DW-20 tractors.

Southwest Welding & Manufacturing Division, Yuba Consolidated Industries, Inc., 3201 West Mission Road, Alhambra, Calif.

For more details circle 102 on Enclosed Return Postal Card.



Southwest Welding's Newest and Largest Sprinkler

New Form Coating

A new compound called "Nox-Crete Form Coating" is said to be remarkably effective as a releasing agent on concrete forms and molds. According to the manufacturer, it reacts instantly to deactivate the surface bonding of concrete while in the wet stage. This quick action provides a lasting escape route for air, and results in uniformly clean, smooth, high-white, flat surfaces, essentially free from voids. Its chemical action is largely attributed to a coniferous oil base.

The coating may be sprayed, swabbed or brushed on. It is said to work equally well on all types of concrete forms and molds, including wood, masonite and metal—and to have the unusual property of working effectively on fibre forms. Plywood which has received repeated applications acquires an effective resistance to bonding with concrete.

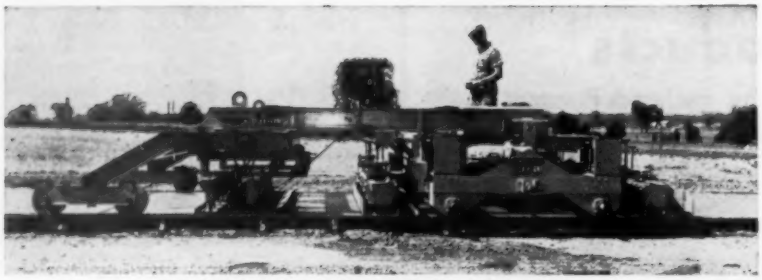
"Nox-Crete Form Coating" distinct from "Nox Crete," another product of the same manufacturer, which is used as a bond-breaker to facilitate removal of old concrete build-up, as a preventative for new build-up, as a rust preventive, and as an efficient and time-saving maintenance item for all types of machinery, equipment and tools that come in contact with concrete. Industrial Lubricants, Inc. of Omaha, Nebraska, is the manufacturer.

Distributor for the United States is Universal Builders Supply Company, Inc., 787 United Nations Plaza, New York, N. Y.

For more details circle 103 on Enclosed Return Postal Card.

Finisher-Float Machine

The all-new 1959 model "Flex-Plane" gas-electric combination finisher-float machine is announced. By utilizing two separate gas-electric drives, Heltzel engineers state that they have achieved a smoother power flow with infinite speed



"Flex-Plane," 1959 Gas-Electric Model

ranges both to the drive wheels and screeds. Thus the rate of machine travel doesn't affect screed operation. The self-contained finisher section can be quickly detached and used independently. Its frame adjusts from 12 ft. to 26 ft. to handle single lanes, double lanes, ramps or approaches. Contractors report that a minimum of hand finishing is required. Both the finishing section and the float section can be equipped with their own pneumatic wheels for over-the-road towing.

The Flexible Road Joint Machine Co., Warren, Ohio.

For more details circle 104 on Enclosed Return Postal Card.

Side-Dump Bucket

International Wagner loaders with new side-dump buckets, designed to reduce the cycle time of loading operations, now are available with International 240, 340, and 460 Industrial tractors.

The new buckets elminate one complete forward and reverse movement necessary in forward dumping. Maneuvering is cut to a simple forward-reverse action. The operator merely drives the tractor forward into the pile to pick up a load, then reverses directly into position alongside the truck and dumps.

For more details circle 105 on Enclosed Return Postal Card.

Trailer Platform

Highway Trailer Co. has begun production at its Edgerton, Wisc. plant of a new lightweight heavy-duty semi-trailer platform designed primarily for tandem tractor operation. It is also adapted to a single axle tractor.

The new design enables the platform to stay light in weight yet strong by utilizing Hi-tensile steel construction. Capable of carrying up to 50,000 lb. of uniformly distributed payload, it is stated to be especially suitable for the transportation of cement blocks, sacked cement, construction steel, and extra-heavy freight. It is available in a 10-in. radius front-corners model or a square-front model. Lengths are from 32 ft. 4 in. through 40 ft. Floor is $1\frac{5}{16}$ in. tongue and groove fir. Optional floors are available.

Highway Trailer Co., New York 17, N. Y.

For more details circle 106 on Enclosed Return Postal Card.

125-Ton Crane

A new lift crane, the Model 4000, announced by Manitowoc Engineering Corp., is slated to have a 125-ton lifting capacity at 17 ft. radius. It has a heavy, massive rotating base with huge hook and house rollers for fast, smooth swings carrying the heaviest loads. Big, stable undercarriage and long, wide-spread crawlers provide a solid lifting foundation. Upper works feature a double drum boom hoist of the self-locking worm gear type that cannot "free-wheel".

Manitowoc New Model 4000 Crane

Basic boom supplied with the Model 4000 is a new Manitowoc "T" section of 125 ton capacity. Extra long tubular booms are also available for maximum reach, light-weight lifting assignments.

Manitowoc Engineering Corp., Manitowoc, Wisc.

For more details circle 107 on Enclosed Return Postal Card.

Two New Engines

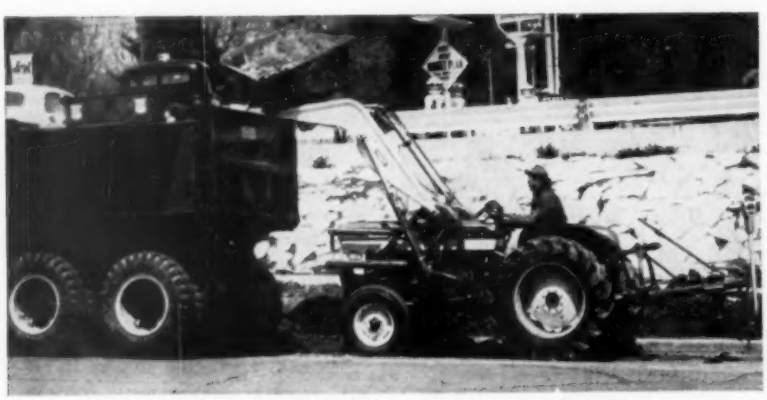
Two new six-cylinder, heavy-duty, carbureted engines now are in production by International Harvester Company's Construction Equipment Division—the International UB-264, with 264-cu. in. displacement and 153 maximum horsepower at 3,800 rpm, and the International UB-220, with 220-cu. in. displacement and 112 maximum horsepower at 3,800 rpm. Both weigh 810 lb.

These valve-in-head engines with down-draft carburetion are designed to provide maximum power with minimum fuel consumption. Down-draft carburetion gives natural downward flow of fuel-air mixture into engine cylinders for more power at high speeds. The regular fuel pump transfers gasoline from the conveniently-located tank up to the carburetor. Among features of the UB-264 and the UB-220 are fully counterbalanced crankshafts, aluminum alloy pistons, gear-driven camshafts, and 12-volt electrical systems.

Simple, low-cost maintenance is assured through use of ball bearing self-sealing water pumps, theremostatic by-pass temperature controls, easily accessible spark plugs and distributor, and convenient overhead valve adjustments.

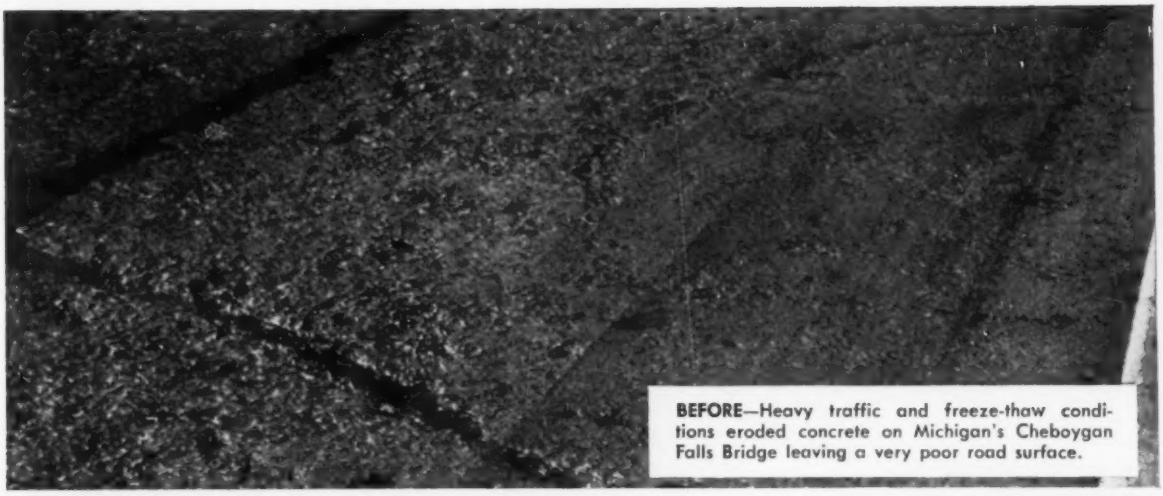
International Harvester Co., 180 N. Michigan Ave., Chicago, Ill.

For more details circle 108 on Enclosed Return Postal Card.

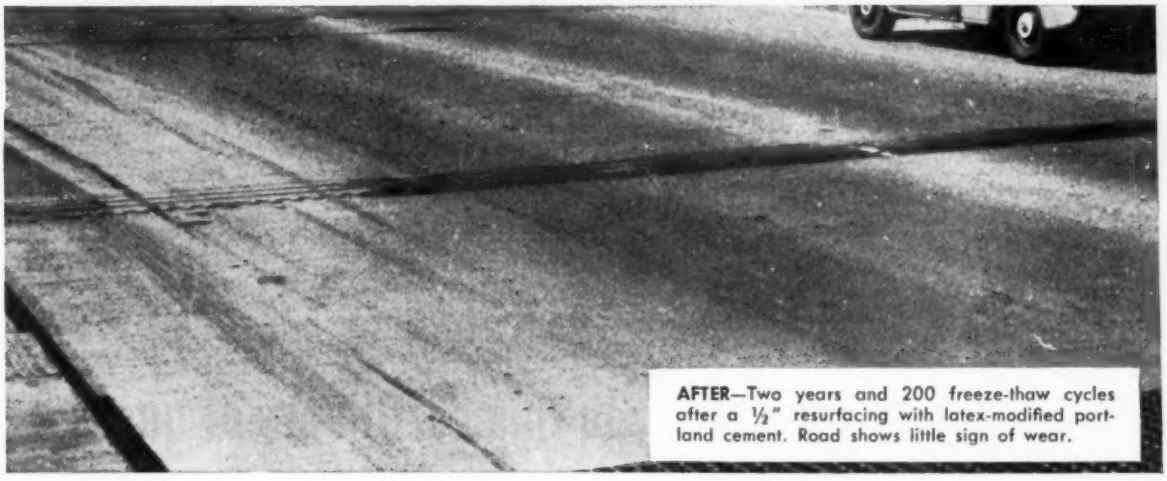


Loader with Side-Dump Bucket on International 460 Tractor

DOW | LATEX



BEFORE—Heavy traffic and freeze-thaw conditions eroded concrete on Michigan's Cheboygan Falls Bridge leaving a very poor road surface.



AFTER—Two years and 200 freeze-thaw cycles after a ½" resurfacing with latex-modified portland cement. Road shows little sign of wear.

SUPERIOR DURABILITY

indicated by 2-year bridge resurfacing exposure

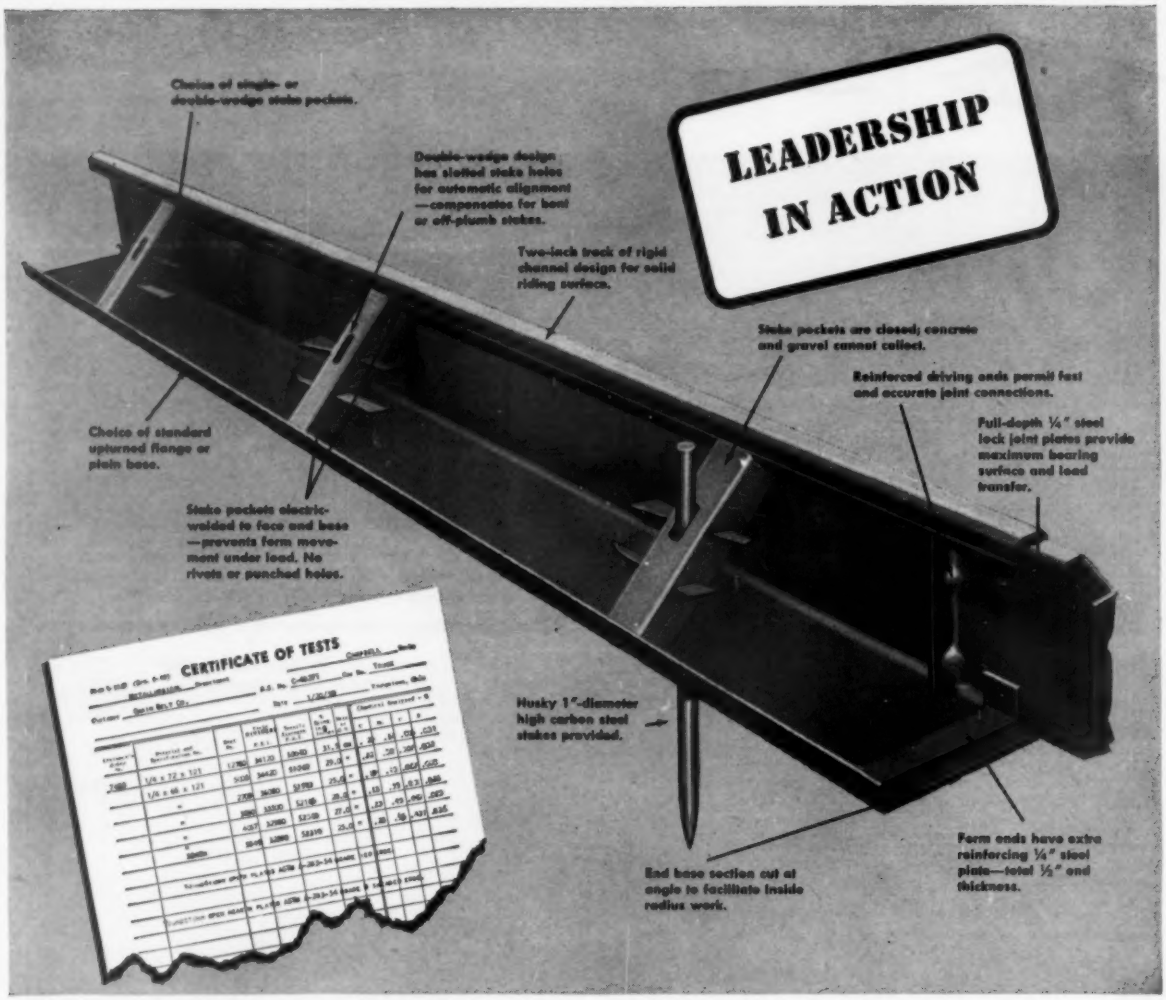
First reports after two years of testing on Michigan's Cheboygan Falls Bridge indicate one of the most successful concrete resurfacing jobs ever to come down the pike! Results have spurred many highway engineers and research men to investigate new latex-modified portland cement. Other tests are now underway in Michigan, as well as New York, Vermont, Massachusetts and Ohio.

Here's what happened: It was found that even after two years the ½" resurfacing on the Cheboygan Falls Bridge showed no spalling . . . no pitting . . . practically no wear in spite of the heavy traffic, and approximately 200 freeze-thaw cycles! Low water absorption, plus greater pliability, tensile and bond strengths and ability to form a monolithic layer with the original concrete allowed the portland cement mortar modified with latex to conform to the expansion-contraction cycle of the concrete—and reduce stress on the new surface. And the latex-modified portland cement surfacing required a minimum thickness of only ½", compared with the 2" to 6" thicknesses required with conventional concrete resurfacing—a big saving in preparation costs.

This new latex for modifying portland cement is the result of Dow's constant research for new ways to make interior and exterior products better with latex. Start testing this remarkable product now. Write for a technical report giving full details on how to apply and test latex-modified portland cement on structural concrete bridges and highways. THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Department 2341EK9.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

. . . for more details circle 312 on enclosed return postal card

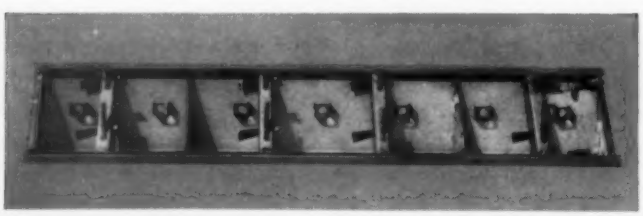


Only Rex Road Forms give you this certificate of quality!

This certificate of tests is your proof that Rex Road Forms are fabricated of high-grade, high-strength, carbon alloy steel. It's your assurance of greatest load-carrying ability and lasting resistance to twist, strain and fatigue—far longer re-use life.

Every shipment is marked with the customer's order number and carries this certificate—another mark of Rex quality.

You get what you want with Rex Quality Road Forms, in size, delivery and price. Call your Rex Distributor.



Reserved for you—a brand-new bulletin covering Rex Steel Forms. Gives complete descriptions, design details, specifications, sizes—all you want to know. Ask your Rex Distributor or write CHAIN Belt Company, 4652 W. Greenfield Ave., Milwaukee 1, Wisconsin. In Canada: CHAIN Belt (Canada) Ltd., 1181 Sheppard Ave. East, Toronto, Ontario. Distributors in all principal cities of the world.

REX AIRPORT FORMS—have a tremendous strength factor with heavily gusseted and reinforced design. Sturdy dowel end connections operate in sleeves of cold-drawn tubing for lasting ease of engaging forms, lasting alignment. In the size you require.

REX®

CONSTRUCTION MACHINERY

. . . for more details circle 309 on enclosed return postal card

New Products

Crane Lifts 190,000 lb.

Heavy lifts, up to 190,000 lb., when working at a 12-ft. radius with a 60-ft. boom is one of the important features claimed for the new Koehring Model 1295 lift crane. The unit is equipped with special wide axles providing a crawler width of 13 ft., 4 in., center to center of crawler girders. With 42-in.

Koehring Model 1295 Litt Crane

shoes, the outside to outside crawler width is 16 ft. 10 in. Length of crawlers, 19 ft. 3 in.

The new crane can be equipped with a third drum, automatic power boom lowering, power load lowering, and independent traction, as optional equipment.

Koehring Division, 3026 West Concordia Ave., Milwaukee 16, Wis.

For more details circle 109 on Enclosed Return Postal Card.

Refuse Collector

A new one-man operated power sweeper, the "Grounds Groomer", announced by Ronning Corporation, is stated to pick up wet leaves, dry leaves, grass cuttings, scrap paper, sticks, stones, and bottles without damage to turf or equipment. It operates at speeds up to 12 mph, depending upon terrain and condition of litter. It's power-driven pick-up brush, 5-ft. wide and 14-in. in diameter, has fingers made of durable belting material. The quick-dump body has a capacity of 7 cu. yds.

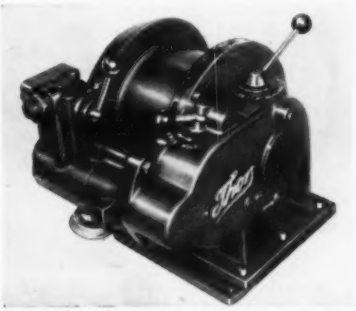
The "Grounds Groomer"

Ronning Corporation, 951 Central Ave., Minneapolis 13, Minn.

For more details circle 110 on Enclosed Return Postal Card.

1500-Lb. Tugger Hoist

A new 1500-lb. capacity air-operated tugger hoist with an extremely responsive dual control system has been developed for construction and mining applications by Thor Power Tool Co. The new Thor No. 1500 is designed to lift, lower, and hold loads by air power or permit free-wheeling lowering of



Thor No. 1500 Tugger Hoist with Mounted Throttle Control

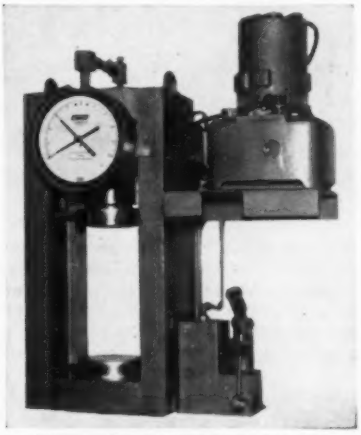
unloaded rope. It is built for operation at floor level and has wire-rope capacity of 280 ft. The throttle control is furnished standard mounted on the hoist, but can be removed and operated from a remote position by means of connecting hoses.

Thor Power Tool Co., 175 N. State St., Aurora, Ill.

For more details circle 111 on Enclosed Return Postal Card.

Jobsite Concrete Test

The new Forney Model FT-20-E testing machine has the special constant flow electric pump permanently mounted, thus saving pump and hose



Forney Model FT-20-E Testing Machine

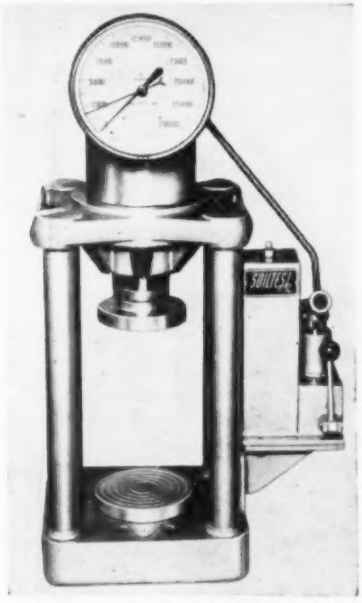
attachment. The model weighs 540 lb. equipped with both manual and electric pumps and has a maximum load rating of 250,000 lb.

Forney's Incorporated, Tester Division, P. O. Box 310, New Castle, Pa.

For more details circle 112 on Enclosed Return Postal Card.

Concrete Testing Machine

A new 250,000-lb. capacity portable concrete testing machine, announced by Soiltest, Inc., makes it possible to test concrete at the job site, as well as in a central laboratory. It is designed for testing standard 6 by 12 in. cylinders and also for testing beams, 2 in.



125-Ton Capacity Testing Machine

cubes, concrete blocks, and other concrete specimens when the proper attachments are used. In addition, drain tile, brick, plastic, ceramics and similar materials can be tested in compression or in flexure.

Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill.

For more details circle 113 on Enclosed Return Postal Card.

Rock Drilling Rig

Finger-tip movement of five levers on the new Thor No. TR-5 crawler drilling rig enables the operator to power-position the drill mast through 10 hydraulic movements, permitting swinging, sliding, raising, and lowering of the mast to any conceivable position to meet any vertical, horizontal, or angular drilling requirement. It is claimed to increase drilling rates two or three times.

The TR-5 is equipped standard with a new Thor No. 140 4½-in. bore drifter, a power-feed mast for 10-ft. steel changes, and a self-propelled tractor-type chassis driven by compact new

Thor No. TR-5 Drilling Rig

draulic system is powered by an 8-hp air motor interchangeable with the track motors.

Thor Power Tool Co., 175 N. State St., Aurora, Ill.

For more details circle 114 on Enclosed Return Postal Card.

Dozer End Bits

"Big L" dozer end bits are designed to rip in rock, hardpan, or clay; to handle round boulders or niggerheads; to split stumps; and to root out trees. They are made for use with most mod-

A "Big L" Dozer End Bit

els D-6-7-8 and 9 Cat. tractors; TD 18-20 and 24 International Harvester; and HD-15 to TD-21 Allis-Chalmers.

Lacey Supply, Inc., 1138 N.W. 17th, Portland 9, Oregon.

For more details circle 115 on Enclosed Return Postal Card.

Pedestrian Signal

A new pedestrian traffic signal designed by Crouse-Hinds Co. is simple in design and modern in appearance and is claimed to be ideal for crossings 50 ft. to 60 ft. wide.

The "Walk—Don't Walk" legends are bright and readable; prismatic lens is 9 in. x 11 in.; rectangular shape identifies the signal as a pedestrian signal. MP-120 mounts with standard signal brackets. No special fittings are required. Arrow indicators, instead of "Walk—Don't Walk" legends, are avail-

MP-120 Pedestrian Signal with Crouse-Hinds Model M-3 Traffic Signal

able for multiple-street vehicular indications.

Crouse-Hinds Co., Syracuse 1, N. Y.

For more details circle 116 on Enclosed Return Postal Card.

Earth Compactor

A new self-propelled, one-man earth compactor is announced by Racine Hydraulics & Machinery, Inc. It is powered by a 4-cycle, 5-hp gas engine and has an adjustable rate of from 400 to 600 blows per minute. It operates in

"Rapak" Compactor

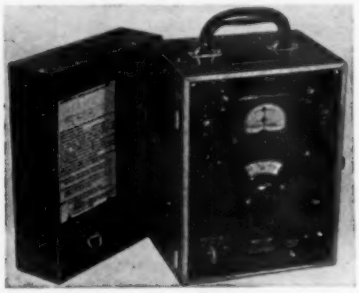
either cohesive or granular soils and is stated to compact cohesives through granular soil to over 100% Proctor density. Interchangeable shoes give the compactor, called the "Rapak," a range of working widths from 6 to 18 in.

Racine Hydraulics & Machinery, Inc., 2000 Albert St., Racine, Wis.

For more details circle 117 on Enclosed Return Postal Card.

Soils Survey Instrument

A new soils survey instrument, the "Vibroground" Model 274-M, is announced by Associated Research, Inc. With it quick earth resistivity surveys may be made by non-technical personnel to provide soil contour profiles



Vibroground Soil Survey Instrument

that clearly indicate the location, depth and extent of gravel and sand layers. The instrument is portable, weighing only 20 lb., and may be operated by one man.

Associated Research, Inc., 3777 W. Belmont Ave., Chicago 18, Ill.

For more details circle 118 on Enclosed Return Postal Card.

Track Adjusters

Increased ease of track adjustment on three Caterpillar-built crawlers has been announced, with the introduction of hydraulic track adjusters as attachments for the D4 and D6 tractors, and No. 977" Traxcavators."

Previously introduced on Caterpillar's three largest track-type tractors, the new adjusters allow track tension

Adjusting Track Tension With Grease Gun

to be adjusted with a standard hand-operated grease gun, and replace the former bolt-and-wrench system. The manufacturer claims prolonged track life as a benefit, since the new, easier method encourages operators to correct track tension at proper intervals.

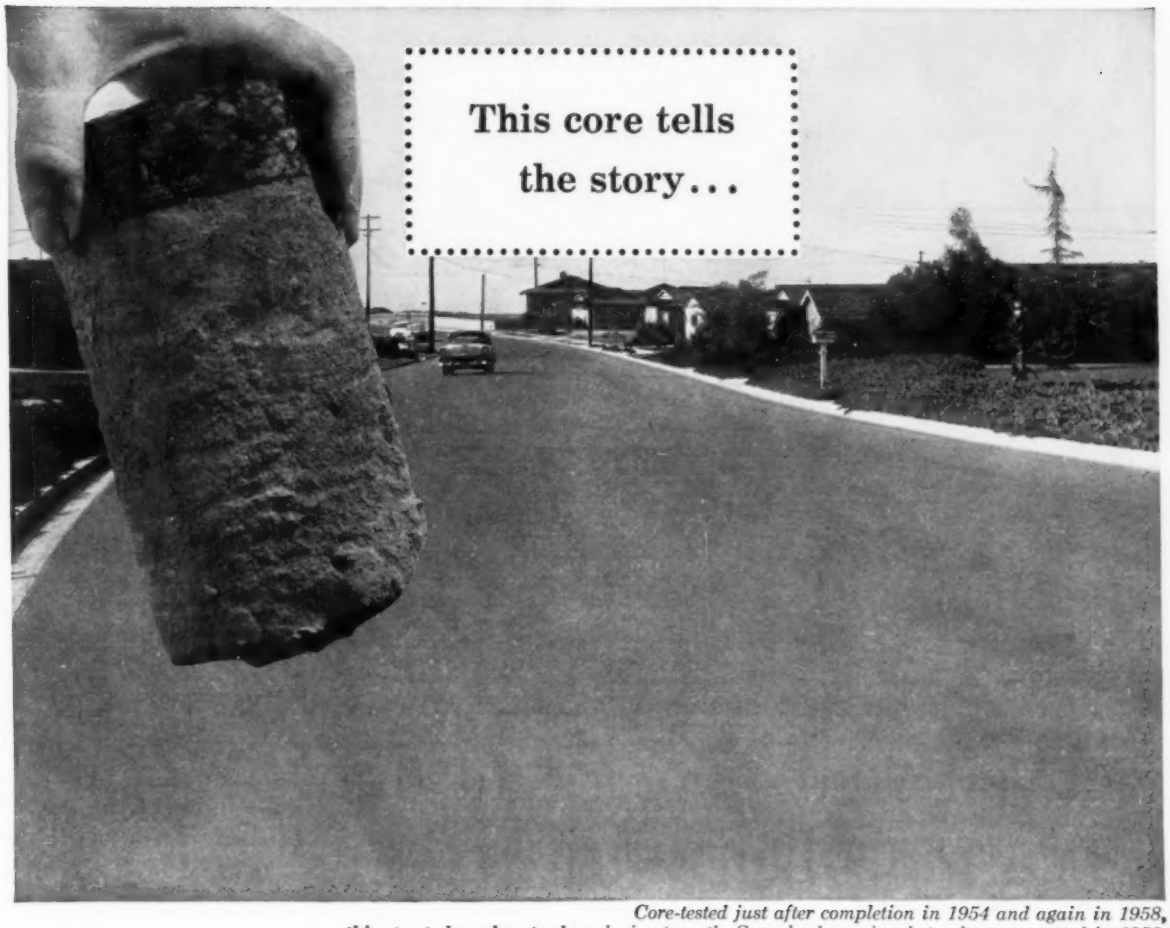
Caterpillar Tractor Co., Peoria, Ill.

For more details circle 119 on Enclosed Return Postal Card.

Roadbuilding Equipment

A new machine, claimed to handle practically every blading job from the scraper to the paver, has been announced by Gurries Manufacturing Co. It is called "Garb". With it, grade

(Continued on page 141)



Core-tested just after completion in 1954 and again in 1958, this street showed a steady gain in strength. Sample shown in photo above was cored in 1958.

On San Diego's La Jolla Ranch Road strength is now 540 psi after just 4 years

...soil-cement pavement grows stronger year by year!

Soil-cement gives more load-bearing strength per dollar than any other low-cost pavement!

Soil-cement is one pavement that really stretches street budgets.

In most cases, 75% of the materials are free! Soil at the site is the main ingredient. Even gravel, or the broken-up old asphalt can be used. This is mixed with portland cement and water, rolled solid and given a bituminous topping. Local traffic can go through on soil-cement pavement right away.

Skilled crews using modern machines can build several blocks a day. And maintenance is kept to a minimum because soil-cement doesn't pothole or soften. It outlasts any other low-cost pavement.

In the last 5 years, the use of soil-cement for roads, streets, shoulders, subbase, airports and parking lots has increased 250%. It's America's fastest-growing low-cost pavement. Write for free information. (U.S. and Canada only.)

PORTLAND CEMENT ASSOCIATION

Dept. A9-28, 33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of portland cement and concrete

MODERN
soil-cement

Even your dome light draws more current than MOTRAC 2-way radio!

Motorola ends costly power drain problems and idling expense with the first fully transistorized receiver and power supply

What makes Motorola MOTRAC radio the most economical and reliable 2-way radio unit in the annals of mobile communications? Not just one or two new features, but a score of revolutionary design advancements that bring you the very finest set ever engineered.

1. On standby—the MOTRAC receiver draws only a trickle of current—actually 80% less than conventional units—with an occasional increase to maintain crystals at proper temperature for precise on-frequency operation (even your dome light draws more current than MOTRAC radio). Yet, this radio is always poised for instant reception, thanks to its fully transistorized receiver. Result: no life-shortening battery drain . . . no more costly, unnecessary engine idling.

2. MOTRAC radio eliminates the most common maintenance problems: vibrators in the power supply and tubes in the receiver. All are replaced by stabilized long-life transistors.

3. Up to 40°F cooler operation means less aging and strain on components. Reason: no more receiver tube filaments; a more efficient power supply; a battery saver switch to cut off transmitter filaments; and two separate heat sinks—one for power supply, another for transmitter output tubes.

4. The MOTRAC receiver operates directly from the 12-volt battery; its low voltage operation results in less electrical strain on components, assures long life.

5. Traditional Motorola engineering and production excellence are evident throughout MOTRAC radio. Transistors undergo three separate checks, including a week of stabilization at 185°F. Only industrial-type tubes, especially suitable for the rigors of mobile operation, are used in the transmitter.

6. Patient production testing continues under stringent quality control procedures. First, each module is tested. Then each chassis is independently checked. Next, each radio is tested as a composite whole. Finally, the entire radio and associated accessories are checked out as a complete operating system.

7. MOTRAC radio is conservatively designed. The receiver has *even higher* reserve gain than conventional Motorola units to assure *peak performance* for many years. Also, power supply transistors are operated under an exceptionally high safety factor to assure extended service life.

8. Completely independent receiver and transmitter chassis, with no power supply in common, assure reliable reception regardless of transmitter performance.

9. MOTRAC radio offers you 2½ to 3 times higher audio output than conventional sets.

10. MOTRAC radio is designed for split-channel operation. *Both* receiver and transmitter meet critical split-channel stability frequency requirements.

Experienced users have been field testing MOTRAC radios for many months. The results are in—and they're excellent. We'd like to tell you *all* about them. Write, wire or call: Motorola Communications & Electronics, Inc., A Subsidiary of Motorola, Inc., 4501 West Augusta Blvd., Chicago 51, Ill., SP 2-6500. MOTRAC is a Motorola, Inc. trademark.

. . . for more details circle 351 on enclosed return postal card

New Products

(Continued from page 138)

is maintained from a patented automatic 44-ft wheelbase. Cross-slope is held by a patented fully-hydraulic automatic pendulum control. Both blade height for grade and cross-slope are set on large dials by the operator.

The "Garb" is stated to be accurate to 1/25th in. in 15 ft. It has a 13-ft. blade, 10-cu. yd. bowl capacity, and weighs approximately 28,000 lb. It

"Garb" Automatic Road Builder

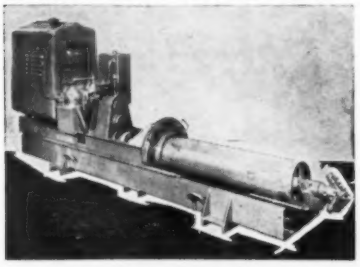
has a 20-in. diameter conveyor screw set laterally in the bowl for balancing the load in the bowl in spreading operations or for side casting into a windrow. The unit has a constant cut and windrowing capacity of 2 ft. cut, 15 ft. wide at 2½ mph. Intermittent cuts are limited only by tractor size.

Gurries Manufacturing Co., 1720 South First St., San Jose 12, Calif.

For more details circle 120 on Enclosed Return Postal Card.

Trench Drill

Salem Tool Company's new Model 16-D trench drill here pictured, is stated to drill horizontal holes up to 200 ft. and to push casings as far as 125 ft. Pipe pusher and guide are



The New Model 16-D Trench Drill

standard equipment. Unit has variable speed hydraulic feed installed in a rigid frame for drilling accuracy. Drill handles up to 16-in. diameter augers.

The Salem Tool Co., S. Ellsworth Ave., Salem, Ohio.

For more details circle 121 on Enclosed Return Postal Card.

Structural Adhesive

A non-sagging structural adhesive, "Epoweld 813," is said to function outstandingly under either shear or tensile loads, and to be ideal for patching and filling overhead and vertical areas where there are cracks, spalls, fissures, and roughs. It is an inert compound, not affected by extremes of temperature, expansion, or contraction.

Coast Pro-Seal & Mfg. Co., 2235 Beverly Blvd., Los Angeles 57, Calif.

For more details circle 122 on Enclosed Return Postal Card.

A-C Welder

A new 40 V, 60% duty at 200 amp welder is announced by Miller Electric Mfg. Co., Inc. Features include: fast, precise current settings through moveable shunt; two ranges of from 25 to 115 and 80 to 295 amperes; high open circuit voltage; forced draft cooling;

Miller M-295 Welder

"Cam-Lok" connectors and heavy duty "on-off" panel switch; baked enamel case with rust preventive prime coating; 25½ in. overall height.

Wired for either 230 or 460-volt service, the M-295 is also available with power factor correction, special voltages, and complete accessory package including skids and either steel or rubber-tire running gear.

Miller Electric Co., Inc., Appleton, Wis.

For more details circle 123 on Enclosed Return Postal Card.

New Abrasive Surface

"Seeded Emeri-Epox," a highly abrasive, non-slip surface for vehicular and pedestrian traffic, has just been introduced by Walter Maguire Company. Its components—specially graded aggregates of hard, non-absorbent emery and tough, highly adhesive epoxy resins—are the same as in the original "Emeri-Epox," but in the new form they are offered in separate packages so that the liquid plastic may be applied first and the aggregate seeded into the surface afterwards.

Swabbing and Seeding a Pavement Surface.

It is stated that the material bonds well to concrete, asphalt, wood, tile, stone, brick, and metal surfaces and offers superior resistance to chemical attack and mechanical abuse; also that it is flexible, shrinkproof and waterproof, and will not freeze in storage.

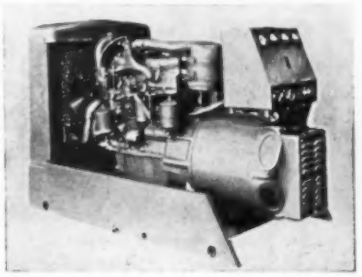
The adhesive component is supplied by the manufacturer as equal quantities of two separate liquids, the epoxy resin and its catlyst, which are blended by the user and swabbed into place with brush or squeegee. Traction may be varied, not only by the way in which the plastic is seeded, but also by choice of two different grades of emery aggregate offered by the manufacturer. The new surface is hard and ready for heavy-duty service a few hours after application. Coverage is 40 to 75 sq. ft. per gallon of liquid.

Walter Maguire Company, Inc., 60 East 42nd St., New York 17, N. Y.

For more details circle 124 on Enclosed Return Postal Card.

Diesel Electric Plant

A new 25,000-watt diesel-electric generating plant is announced by Onan. Completely self-contained, with its water-cooled Hercules DD226 60-hp diesel engine, Onan "Magneciter" generator, and Onan controls assembled into one compact unit, this new set will provide smooth-running, full-



Model 25 DZC 25-kw Electric Plant

rated 25kw for both primary and emergency standby applications.

As a prime power unit, where a dependable continuous source of electricity is demanded, the new Series DZC is stated to be equally at home in the oil fields, heavy construction industry, mining camps, railroads, and light construction jobs.

D. W. Onan & Sons, Inc., 2515 University Ave., S.E., Minneapolis 14, Minn.

For more details circle 125 on Enclosed Return Postal Card.

Tire Rims

The earthmover rim line marketed by the Goodyear Tire & Rubber Co. has been re-designed and two new sizes

added. All rims from 29 in. in diameter and up are being made stronger and heavier.

The world's largest rim has been added to the top of the line. Developed for use with the company's 44-5-45 tire, it weighs more than a ton. It will be used on special-purpose vehicles and construction machines still in design stages. Size designation is 37.00-45. The other new size is 28.00-39. The new designs have added only 6% to rim weights while strength has been increased by approximatly 40%.

Goodyear Tire & Rubber Co., Akron, Ohio.

For more details circle 126 on Enclosed Return Postal Card.

Map Projector

The "Map-O-Graph," announced by J. A. Engel, Inc., is claimed to speed up and to simplify map and chart work of all types. The machine, a new opaque projector, permits by-passing of photostats and eliminates the need

New Model Moga Map-O-Graph

of divider for changing from one scale to another. Outlines and other information can be hand copied from the projected image with absolute scale accuracy.

J. A. Engel, Inc., 4837 Emerson Ave., South, Minneapolis, Minn.

For more details circle 127 on Enclosed Return Postal Card.

Traffic Island Light

A new traffic island marker, "Guardlite," has been added to the line of Blackhawk Industries. It is an all-weather unit which beams an amber light in four directions. Overall height is 9¾ in. and overall weight of the head is 58 lb.

Finished in traffic yellow with amber lens, the Blackhawk Guardlite is available for a 110-volt system or a 6.6 amp. street series lighting. There is a flasher attachment available if it is to be used for traffic islands in particularly hard-to-see locations.

Blackhawk Industries, Dubuque, Ia.

For more details circle 128 on Enclosed Return Postal Card.

Belt Feeder

A new Barber-Greene Model F-8 belt feeder offers a capacity range from 5 to 550 tph. It is designed for any application where a high degree of accuracy is necessary in feeding construction aggregates, ores, chemicals, etc.

A pre-engineered, packaged unit, the Model F-8 is shipped completely assembled and ready for immediate installation in any selected service.

Model F-8 Belt Feeder

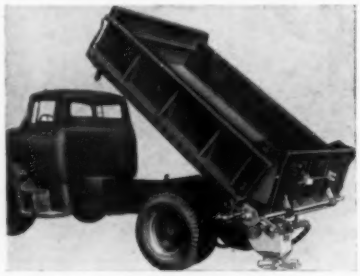
Through the medium of a gearmotor and a roller chain drive, constant belt speed may be attained, with capacity controlled by a quadrant-type control gate equipped with a fine screw adjustment. A variable belt speed arrangement, working in conjunction with a quick-adjusting quadrant gate having control settings in 1-in. increments, is optional.

Barber-Green Co., 400 No. Highland Ave., Aurora, Ill.

For more details circle 129 on Enclosed Return Postal Card.

Tailgate Spreader

Continuously variable dual-hydraulic cab controls which permit the driver to instantly regulate the width and depth of the spread is the outstanding feature of the new Hi-Way Model "TG" tailgate-mounted spreader now available from Highway Equipment Co. The unit is operated by one man who can choose any spreading width from 5 to 40 ft. by touching a fast-acting hydraulic control in the cab. A second hydraulic control regulates the flow of all materials, sand, salt, chips, cinders, and calcium chloride, even heavy bank sand containing an occasional 2-in. stone.



Hi-Way Model "TG" Spreader

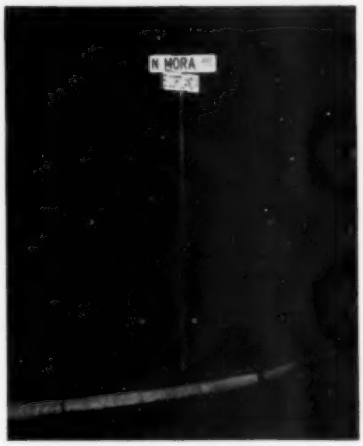
Designed for either ice control or sealcoating work, the Model "TG" also features a stabilizer bar which keeps the 18-in. diameter spinner level at all times, regardless of the dump body angle. The Model "TG" spreader can be mounted in a matter of minutes without the necessity of removing the tailgate from the dump body.

Highway Equipment Co., 616 D. Ave., N.W., Cedar Rapids, Iowa

For more details circle 130 on Enclosed Return Postal Card.

Reflectorized Signs

"Porcelite" reflectorized surface for porcelain enamel signs of all types, is being introduced by California Metal Enameling Co., and offered as a new concept in night-time reflectorization. All components are completely inor-



"Porcelite" Street Sign

ganic, claimed to assure everlasting brilliance with no fading, peeling, or discoloration. Durability and long-life are guaranteed by the manufacturer.

California Metal Enameling Co., 6904 E. Slauson Ave., Los Angeles, Calif.

For more details circle 131 on Enclosed Return Postal Card.

Pavement Sealer

Two new products have been announced by the recently formed Plastic Sealer Corporation. T-33 pavement sealer is an exclusive formula specifically designed to increase the service life of black top areas. It is claimed to prevent softening and deterioration of asphalt from gasoline, oil and jet fuel, and to protect against damage from water, sun, and frost.

"Con-Trol," a concrete curing compound, is sprayed directly on the surface of concrete pavements to control the drying and curing rate, to prevent cracking, and to produce a stronger slab.

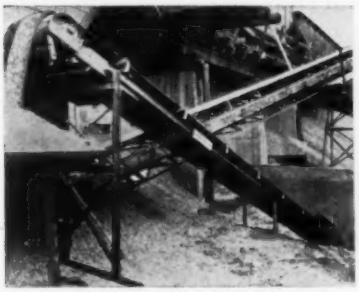
Plastic Sealer Corporation, 830 W. Lane Ave., Columbus 10, Ohio.

For more details circle 132 on Enclosed Return Postal Card.

Transit Conveyors

Conveyors in 18, 24 and 30-in. belt widths and in lengths ranging from 9 to 102 ft. in 1-in. increments are now available in Barber-Greene's Model 375 "Transfer Conveyors" series.

"Transfer Conveyors" are designed and fabricated for immediate installation with an absolute minimum of on-the-job assembly of components. Each



New Barber-Greene Model 375 "Transfer Conveyor"

conveyor head end incorporates a compact and efficient drive and provides an adjustment for length of the unit. Each tail end provides additional adjustment for belt tension through heavy Acme thread screws and is equipped with a built-in loading hopper.

Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill.

Tractor Shovel

The Model W-10, newest addition to the Case Terraload'r line, has just been released to the dealers. This 4-wheel drive, rear-wheel steer tractor shovel has a carry capacity of 6,500 lb. at 4 mph. Standard bucket size is 2 cu. yd. SAE rated, with a 1¼-cu. yd. heavy-duty bucket, and a 2⅞-cu. yd. light materials bucket optional. Lift

Case W-10 Terraload'r

capacity at 0 mph is 13,000 lb. Power is supplied by a Case-built 401-cu. in. 100-hp diesel engine. Optimum power-to-weight ratio is stated to minimize wheel slippage and consequent tire wear. Wide tread and excellent weight distribution, which puts 40% more weight on the rear wheels, is stated to eliminate bucking or raising rear wheels off ground in "break-out."

J. I. Case Co., Racine, Wis.

Dump Body and Hoist

A "packaged" dump body and hoist has been added to the line of truck equipment of Daybrook Hydraulic Division. The body is built to handle 5-ton load capacity and to be installed on a one-ton truck. The hoist is a standard underbody type.

The all-steel body features structural steel underbody construction and a

Daybrook "Packaged" Maintainer Dump Body and Hoist.

full-length sub-frame for chassis support. It is 8 ft. 2 in. long inside dimension and 6 ft. wide. The standard underbody hoist provides for full 45° dumping. The body can be stopped, raised or lowered from any position.

Daybrook Hydraulic Division, Young Spring & Wire Corporation, Bowling Green, Ohio.

Trench Machine Shanks

Trenching machine shanks have been added to the line of teeth and earth boring augers of Petersen Engineering Co. The outstanding features of the new 35 "Pengo Wisdom Tooth" for small machines and the 16A50 "Pengo Wisdom Tooth' for production

"Pengo" Teeth on Trencher

machines is that they are reversible, quick-change, and of forged steel. In addition, the very dense metal for strength and abrasion resistance produced by forging, and the longer available wearing surface' are claimed to make a tooth of exceptionally long life.

Petersen Engineering Co., Inc., 460 Kifer Road, Santa Clara, Calif.

Flasher Lights

A new NRB series "Flashmaster" is announced by Carpenter Mfg. Co. These lights are available with either 2-way 4-in. lenses or a 360° fresnel dome; the lamp is a special neon coil which, it is claimed, will give thousands of hours of service. Continuous

NRB Series "Flashmaster".

operating life of the units is stated to be well in excess of two years. They use any standard 6-volt lantern battery; and the battery-life (under continuous 24-hour operation) averages 8 weeks.

Carpenter Mfg. Co., Bradley St., Somerville 45, Mass.

Crawler Track Rail

A new heavy-duty track rail has been added to the line of Hensley Equipment Co. It is specifically designed for use in Cat, A-C, and International Equipment. Forged from the finest quality alloy-steel, these new rails have

New Hensley Track Rail

been heat-treated by the most modern methods to insure correct Brinnel hardness. Rolled alloy-steel pins and bushings are ground for precision fit. It is stated that the links will not stretch, will always mesh correctly with drive sprocket.

Hensley Equipment Co., Inc., 800 Peralita Ave., San Leandro, Calif.

Equipment Operator's Helmet

A dust-proof, cooled, and air-conditioned helmet for equipment operators is designed for comfort under the adverse conditions prevailing on many construction jobs. Material is light-

The Jamison Helmet

weight fiberglass, with a face plate of clear, shatterproof plastic. A small electric motor wires into any ignition circuit of 12 volts or more.

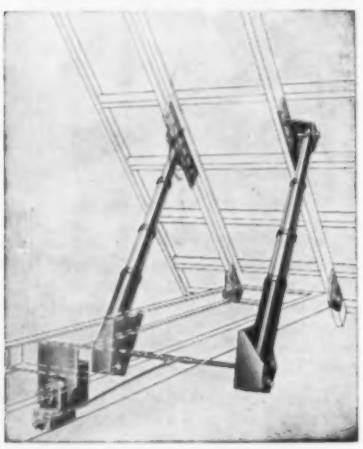
Jamison Laboratories, Inc., 2200 Colorado Ave., Santa Monica, Calif.

For more details circle 139 on Enclosed Return Postal Card.

Conversion Dump Hoist

Hercules Model X25-447, twin-cylinder, telescopic-type conversion hoist especially designed for use under farm-type bodies 13-½ to 18 ft. in length, with 102, 108 or 120-in. cab-to-axle chassis. It is offered as providing the advantages of lightweight, plus the lifting capacity necessary to handle almost any type of farm job. The unit is designed for fast, easy installation. It does not increase mounting height of the truck body.

Commonly referred to as an economy hoist, the Model X25-447 is shipped



New Hoist for Farm-Type Bodies

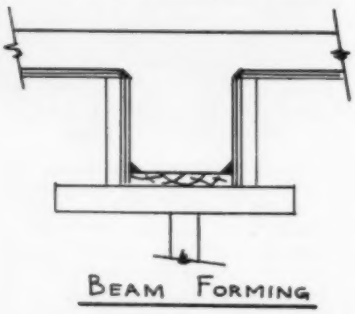
with a deep-gear hydraulic pump, two cylinders, hydraulic line, mounting brackets, and steel lift plates. Total weight including all mounting equipment is approximately 590 lb.

Hercules Galion Products, Inc., Galion, Ohio.

For more details circle 140 on Enclosed Return Postal Card.

Chamfer Strip for Concrete Forming

An innovation in chamfer strip for use on all types of concrete forming is a special rubber extrusion of the proper consistency and stiffness to provide complete flexibility and reusabili-



Sections Showing Universal Chamfer Strip

ty. The manufacturer states that its use will provide contractors with the lowest possible cost as well as eliminate the problem of great leekage at chamfer corners.

Universal Form Clamp Co., 1238 North Kostner Ave., Chicago 51, Ill.

For more details circle 141 on Enclosed Return Postal Card.

12-CFM Air Compressor

A new lightweight, compact air compressor for automotive and industrial applications is announced by Cummins Engine Co. User benefits claimed include: 5 to 20 lb. weight saving, single cylinder 12 cu. ft. design, simplified single air intake and outlet assembly, integral crankshaft and accessory drive.

This compressor is driven by the engine timing gear train and is water cooled. Its crankshaft and bearings also serve as the shaft and bearings for the accessory drive. It is available for

Cummins New Air Compressor

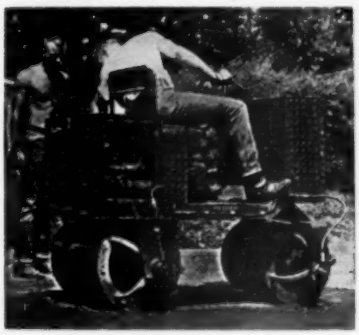
all Cummins H, NH and 6-cylinder J and C series engines.

Cummins Engine Co., Inc., Columbus, Ind.

For more details circle 142 on Enclosed Return Postal Card.

High-Compaction Roller

A new 1-ton asphalt roller built by the Ellis Manufacturing Co. is said to develop more compaction than much heavier machines. It carries a propane tank, supplying fuel to burners within each roller, and it is this application of heat which gives it its high compactive power.



The Ellis 1-Ton Roller

A 7-hp air-cooled Wisconsin engine powers the unit through a chain drive to the rear roll. Front roll is 18 in. in diameter; rear roll is 21 in. Steering is through a worm gear. The unit operates forward and reverse with engine ratio of 50:1. No brakes are required.

Ellis Manufacturing Company, Liberty, Mo.

For more details circle 143 on Enclosed Return Postal Card.

New Concrete Grinder

The Stow model JT50A concrete grinder has a ¾-hp, 3450-rpm motor that is totally enclosed to prevent damage from concrete dust. The motor is mounted on a skid base to make it easier to pull along as the operator

(Continued on page 147)

EXPRESS PAVER at work on Highway 11 in Racine County, Wisconsin. Highway Pavers, Inc. uses the machine on a variety of jobs, finds that the new screed heaters are fifteen to twenty minutes faster, lets crews get underway with less start-up time.

"All my crews prefer the Blaw-Knox Express Pavers"

"The operators find that it is easy to work with because of the rubber tires and fully automatic drive. Truck drivers prefer to dump into the big hopper, and the machine gives a steadier push on the truck. As a result, they can unload and pull out more quickly," reports James F. Peterson, superintendent with Highway Pavers, Inc., Milwaukee.

"With a ten man crew—a paver operator, a screed operator, 3 roller operators, and 5 laborers —we have paved many hours, laying material as fast as the paver would travel. There are fewer carry backs. Bleedouts are less troublesome. There's less shoveling at intersections—the men simply take off the sideplates and the Express Paver does most of the job," he adds.

Performance like this has earned a preferred status for the Blaw-Knox Express Paver with contractors all over America. They want trouble-free, high-volume production that will meet the most rigid highway department specifications. They get it with the Express Paver. You can, too. Your Blaw-Knox Distributor is where you start.

BLAW-KNOX

BLAW-KNOX COMPANY

. . . for more details circle 289 on enclosed return postal card

Construction Equipment
300 Sixth Avenue
Pittsburgh 22, Pennsylvania

New Products

(Continued from page 144)

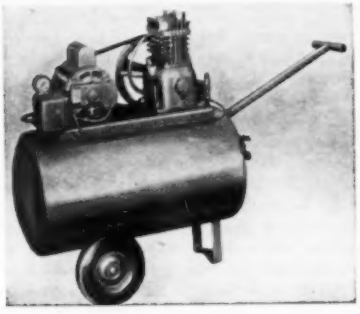
works. An 8-ft. or 12-ft. Stow ½-in. size flexible shaft transmits the power to a wet or dry anglehead. Wet angleheads are furnished for wet rubbing with reduction gearing of 18:1, 10:1, 8:1, or 5:1 and an attachment so that the operator can eject water through the grinding wheel (or disc) on the concrete when required. Dry angleheads for dry grinding are also available with a 1:1 speed ratio. Ask for the pamphlet "How To Grind Concrete."

Stow Mfg. Co., 65 Shear St., Binghamton, N. Y.

For more details circle 144 on Enclosed Return Postal Card.

Small Compressors

Three new tank-mounted air compressors designed for paint spraying, small air tool operation, tire inflation, and similar light work, are announced by National Compressor Corp. Available for immediate delivery are the ½



National Portable Compressor—¾-hp

and ¾ hp units in either wheel-mounted portable or stationary models, and the 1 and 1½ hp units in stationary models only. Operating voltage 110/220, 60 cycle.

National Compressor Corp., 933 N. West Lake Street, Chicago 7, Ill.

For more details circle 145 on Enclosed Return Postal Card.

Air-Powered Inertia Brake for Transmissions

To provide more efficient utilization of equipment, faster work cycles, and reduced operator fatigue, an air-powered countershaft inertia brake is now incorporated as standard on all Fuller transmissions designed for heavy-duty, off-highway service.

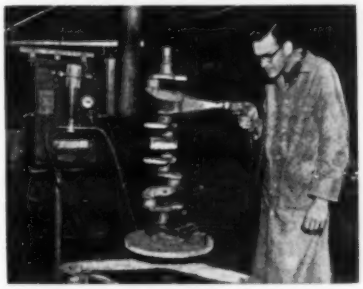
Pre-selected by the operator simply by pressing a button, this brake slows the rotation of the transmission countershaft, main drive gear, and clutch driven plate or plates. Actuation is automatic as the transmission is shifted through neutral, and, because there is no need for the operator to double clutch, deceleration of the vehicle is held to a minimum.

Fuller Manufacturing Co., Transmission Divison, Kalamazoo, Mich.

For more details circle 146 on Enclosed Return Postal Card.

For Worn Crankshafts

The new Colmonoy C-290 metal spray powder is specifically designed for reclamation of worn engine and compressor crankshafts, reclamation of undersized manufacturers' rejects, and modification of crankshafts in special high performance engines. It is stated that overlays have been successfully tested in automotive, marine, and stationary engines, both gasoline and diesel, and in a variety of air and gas compressors.



Metal-Spraying a Crankshaft

The powder, which is high in chromium and nickel and contains wear resistant borides, is applied with the colmonoy "Spraywelder" unit, but is not subsequently fused as in the "Sprayweld" process. Finish grinding of the sprayed journal completes the procedure. A low coefficient of friction and excellent oil retention qualities throughout its fine porous structure are also claimed. All standard bearing inserts may be used with C-290 overlaid crankshafts.

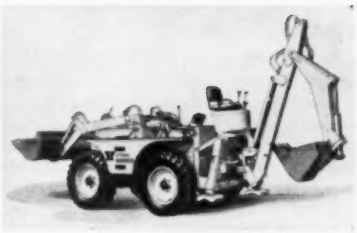
Wall Colmonoy Corp., 19345 John R. St., Detroit 3, Mich.

For more details circle 147 on Enclosed Return Postal Card.

Backhoe and Loader

A new unit-designed self-propelled backhoe and loader called the "Marauder" is announced by Ottawa Steel Division. The manufacturer emphasizes that it is not a tractor with attachments, but an integral digging and loading unit. The 4-wheel drive prime-mover has torque converter transmission capable of speeds from 0 to 25 mph, and shuttle clutch for change of direction without shifting. Power is by a Continental engine.

The backhoe has simple two-lever controls for easy operation, and a wide range of bucket types and sizes, including exclusive Ottawa automatic ejector buckets. It digs 12½ ft. deep



The Ottawa Marauder

in any position of its 190° swing, making it possible to operate in hard-to-reach places.

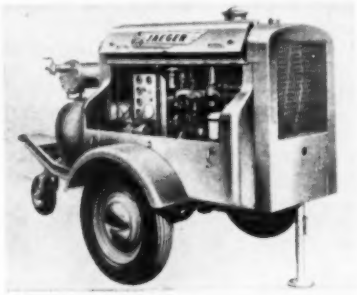
The loader is the basic Ottawa unit, balanced in weight and capacity to provide maximum traction and stability for the backhoe. The patented "One-Trol" single lever control operates both lift and bucket valves, giving simultaneous operation of lift and dump cylinders, as well as simultaneous bucket retraction and lowering. The bucket has 18° rollback for maximum pryout and load retention. Lift capacity is 4500 lb., with 5000 lb. breakout.

Ottawa Steel Division, Young Spring & Wire Corp., Ottawa, Kansas.

For more details circle 148 on Enclosed Return Postal Card.

Rotary Compressor

All the quality features of larger Jaeger rotary compressors are offered in the latest Model 85. It is powered with 45-hp Continental F-162 engine and equipped with 12-volt electric starter. Standard equipment includes hour meter, automatic blow-down valve, thermostatically actuated oil by-pass valve, retractable pneumatic tired dolly wheel, and fenders.



Jaeger Model 85 Rotary Compressor

Compressor unit is a single-stage oil-cooled rotary developing 85 cfm at normal 100 psi pressure. Controls are extremely simple, yet provide instant response to air demands. Pressure is held constant and speed is smoothly modulated without possibility of over-run or racing of the engine.

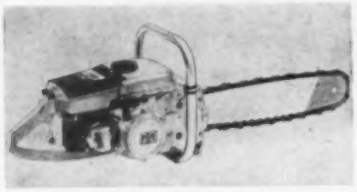
The Jaeger Machine Co., Columbus 16, Ohio.

For more details circle 149 on Enclosed Return Postal Card.

Chain Saws

A new line of seven McCulloch chain saws has been announced. Included is a new gear-drive unit, the ONE/60, designed primarily for pulp cutting, sawing, mine timbers, piling, and other woodcutting jobs where extra lugging power is needed from a medium-sized engine. It comes equipped with either a regular cutter bar or plunge bow.

Other models in the McCulloch line



McCulloch ONE/60 Chain Saw

include the MAC 35A, low-priced gear-drive chain saw; the McCulloch ONE/-40, low-priced direct-drive model; the ONE/50, a more powerful direct-drive saw; the ONE/70, the fastest, most powerful direct-drive saw in the line; the ONE/80, most powerful gear drive one-man saw; and the MODEL 99, heavy-duty two-man saw.

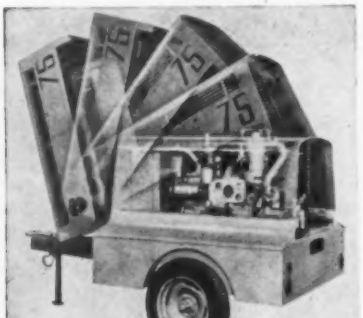
McCulloch Corporation, Chain Saw Division, 6101 West Century Boulevard, Los Angeles 45, Calif.

For more details circle 150 on Enclosed Return Postal Card.

75-CFM Rotary Compressor

Clean-line styling and a "flip-top" housing are two features of the new Le Roi 75 RG1, a sliding vane type, single-stage rotary air compressor. Rated at 75 cfm of free air compressed to 100 psi, the unit is powered by a gasoline engine. The rust-proof aluminum "flip-top" housing offers full-view servicing and maintenance.

A 100% capacity modulating control matches air supply to demand so that the correct amount of pressure is delivered to the air tool or spraying equipment. Full load speed of the 4-cylinder engine is only 1850 rpm. Unloaded speed—1000 rpm. Dimensions—



Phantom View of 75 RG1 Hood Top in Possible Positions for Easy Maintenance

8 ft. 11 in. long, 4 ft. 7 in. wide and 4 ft. 9½ in. high.

Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisc.

For more details circle 151 on Enclosed Return Postal Card.

Electric Plants

New 10,000 AD electric plants, available either trailer-mounted or on skids, are being introduced by Pacific Mercury. They are 60 cycle, 120/240 or 120/208 volt units, single or three phase, with four cycle, four cylinder air-cooled Wisconsin engines. Sixteen outlet receptacles for convenient operation

PM 10,000 AD Electric Plant

of power tools or other equipment are included at no extra cost.

The 10,000 AD electric plant also comes completely equipped with battery charger, electric RPM indicator, Neoprene shock-absorbing feet, automatic spark advance, mildew-proof windings, missile specification wiring and flyball governor—all at no added charge.

Pacific Mercury, 14052 Burbank Boulevard, Van Nuys, Calif.

For more details circle 152 on Enclosed Return Postal Card.

Tubular Welding Wires

A complete new line of tubular wires for semi-automatic resurfacing is announced by Hobart Brothers Co. These wires are fabricated and contain alloys for application through conventional semi-automatic welders which automatically feed the wire when the arc is struck. They can be applied with either the open arc or submerged arc process. Any type welding machine of sufficient capacity to handle the high weld deposition rate and high duty cycle may be used as a power source (Usually a 300-ampere welder or larger).

Resurfacing with Tubular Welding Wire

Hobart Brothers Co., Troy, Ohio.

For more details circle 153 on Enclosed Return Postal Card.

Belt Conveyor Pulley

A new conveyor pulley claimed to increase conveyor belt life and to have 25% greater strength, has been announced by Link-Belt Co. The pulley is concentric too 0.030 in. and is free from crown welds.

The rim of the new "Die Crown" steel pulley is formed in a die by hydraulic pressure for accurate control of crown contour as well as pulley diameter. Link-Belt's method of hydro-expansion is stated to assure that the crown is formed on true center.

Link-Belt Co., Prudential Plaza, Chicago 1, Ill.

For more details circle 154 on Enclosed Return Postal Card.

Bituminous Finisher Control

An air control system that automatically regulates material flow to the screed of a bituminous finisher has been incorporated into standard design on Blaw-Knox Company's "Express Paver." Formerly it was offered as optional equipment.

The system's fingertop control panel, easily moved to either side of the machine, automatically adjusts correct material flow to the screed, thus eliminating necessity of operator view and control of material moving from the 10-ton capacity hopper to the screed. Automatic control of the material feed system is obtained through a sensing element in the spreading zone, preventing auger over-feeding or underfeeding, through automatic actuation of auger and conveyor air clutches.

Offered as optional equipment with the air control system is a highly audible horn, used as a signal between paver operator and truck drivers to speed dumping operations.

Blaw-Knox Company, 300 Sixth Ave., Pittsburgh, Pa.

For more details circle 155 on Enclosed Return Postal Card.

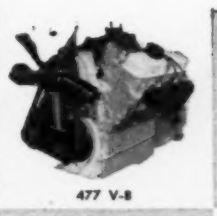
Improved Tractor Shovel

A new 1½-cu. yd. HD-6G tractor shovel is now in production at the Allis-Chalmers Manufacturing Company Springfield (Ill.) works. The engine is an A-C 4-cycle diesel rated at 72 net hp. Four forward speeds from 1.5 to 5.5 mph and two reverse speeds of 2.0 and 4.1 mph may be selected with the convenient single lever shift.

Dumping height of the unit is over

(Continued on page 153)

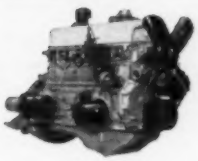

534 V-8


477 V-8

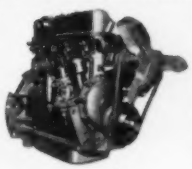

401 V-8

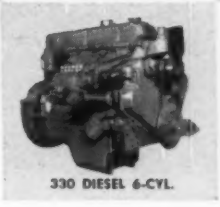

332 V-8


272 V-8


223 6-CYL.


172 4-CYL.


134 4-CYL.


330 DIESEL 6-CYL.


220 DIESEL 4-CYL.

NOW...TEN FORD INDUSTRIAL ENGINES TO MEET YOUR POWER NEEDS!

Whatever your application, consider the many advantages you get with a Ford Industrial Engine.

Completely modern throughout, all Ford engines have Short Stroke design for increased operating economy . . . overhead-valve construction for quick, easy servicing . . . and provide more horsepower per pound of engine weight than ever before possible. To cut costs on *big* jobs, Ford offers 3 new Super Heavy Duty V-8's with totally new lubrication-, cooling-, and fuel-systems.

Ford Industrial Engines range from 134 to 534 cubic inches . . . including two Diesels. All are available as engine assemblies or power units, and can be fitted with Ford-approved attachments such as SAE housings, torque converters, transmissions and other equipment for special operating needs.

What's more, Ford users enjoy a minimum of downtime because there's always a Ford Dealer nearby with a complete stock of the more commonly purchased replacement parts. Yours at low Ford prices.

Get the *right* power for your application. Check Ford's full line of 4-, 6-, and V-8-cylinder engines soon.

INDUSTRIAL ENGINE DEPARTMENT • FORD Division of FORD MOTOR COMPANY
P. O. Box 598, Dearborn, Michigan

YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED!

. . . for more details circle 321 on enclosed return postal card

Applying Columbia Calcium Chloride is the fast, low-cost way to build high surface density.

COLUMBIA CALCIUM CHLORIDE

helps your roads through late fall and winter

Within the next few weeks, your crews will have finished putting roads in shape to stand up under late fall and winter weather conditions: patrol blading, adding aggregate or binder soil where needed—and spreading Columbia Calcium Chloride.

The dense, compact surfaces resulting from Columbia Calcium Chloride resist rutting and pot-holing infinitely better than untreated roads. Motorists enjoy smoother, safer driving. Fewer bladings are necessary; new material requirements are cut. Maintenance costs show marked improvement right through the year. Helps you meet your road budget.

And, with winter's snow and ice just a few months away, you'll want to order Columbia Calcium Chloride right now for ice control and for treating abrasive stockpiles to prevent freezing. Check to make sure you have adequate stocks of Columbia Calcium Chloride on hand before the first snow flurries. If you're running low, just call our nearest District Office or write our Pittsburgh address to place your order.

Columbia Calcium Chloride mixed with abrasives or salt provides ice removal that's both fast and economical.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

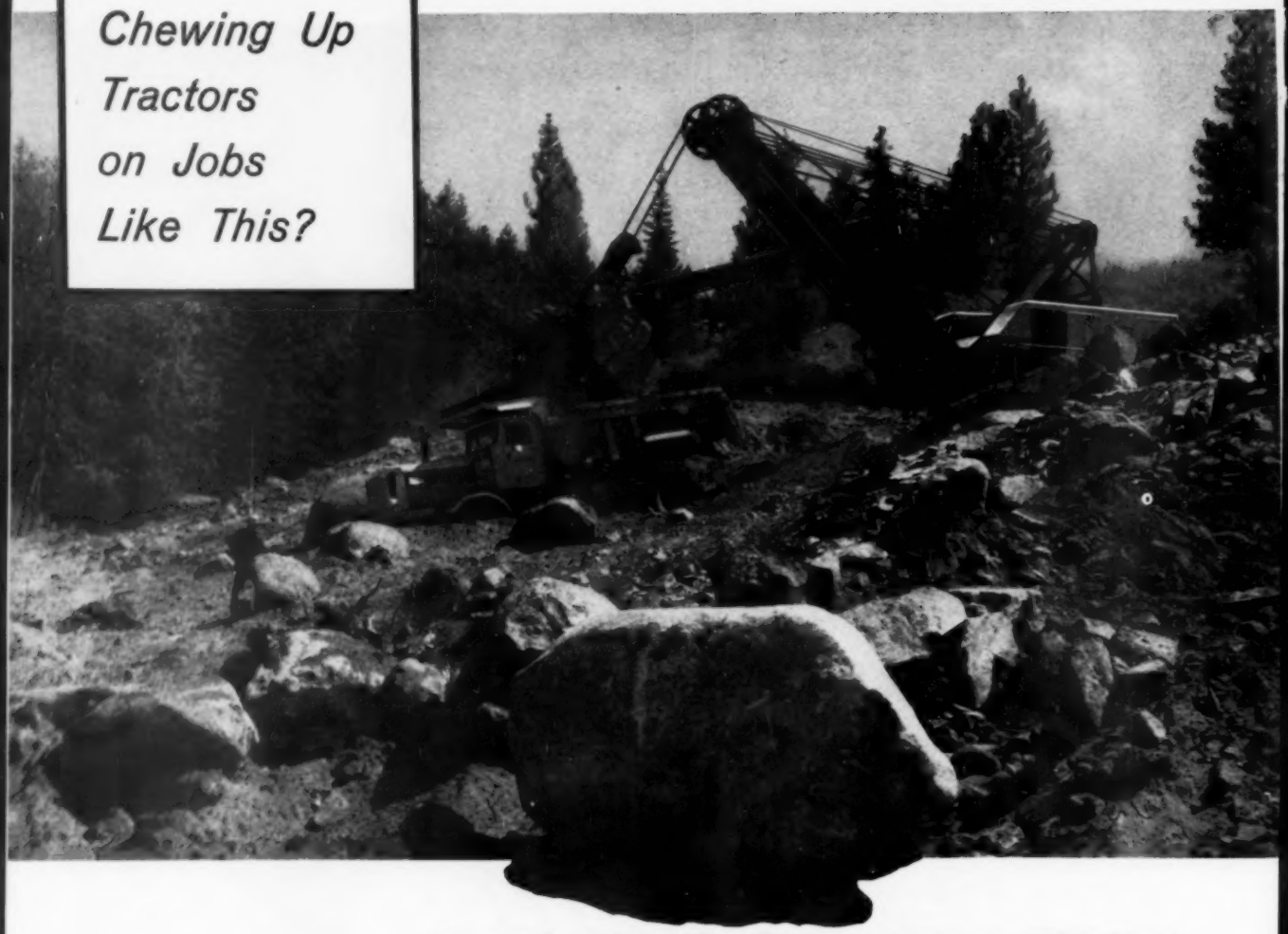
A Subsidiary of Pittsburgh Plate Glass Company · One Gateway Center, Pittsburgh 22, Pennsylvania

DISTRICT OFFICES: Cincinnati · Charlotte · Chicago · Cleveland · Boston · New York · St. Louis · Minneapolis · New Orleans · Dallas · Houston Pittsburgh · Philadelphia · San Francisco IN CANADA: Standard Chemical Limited

. . . for more details circle 307 on enclosed return postal card

Chewing Up

Chewing Up Tractors on Jobs Like This?



4-yd 88-B Proves a Point on Mountainous Interstate 40

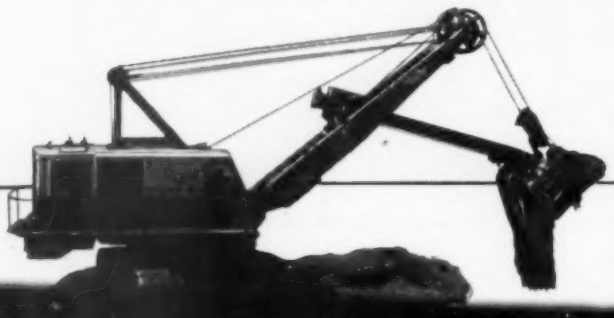
Does a big shovel have a place on today's highway jobs? Wood-Kirst Company made it an emphatic "YES" as its 4-yd Bucyrus-Erie 88-B banged through its 700,000-cu yd share of a 1,200,000-yd job on relocation of U. S. Interstate 40 near California's worst snow zone—mountainous Donner Pass.

Wood-Kirst proved there was no need to tear tractors to pieces with rippers and scrapers in this marginal material . . . by putting the *big* shovel to work. It handled the job faster and more profitably.

Why? Because the 88-B shovel has the best crowd system of any 4-yd rig — twin rope balanced crowd. It gives the operator full control over both crowd *and* hoist at the most critical point in the digging cycle — as the dipper enters the bank. With speed and force automatically proportioned between these two functions, it's no wonder that the 88-B, in straightaway mucking, turned out truckloads of material in four passes, including broken granite where bank toe was exceptionally tight. Assigned to the toughest rock on the project, the 88-B logged over 700 hours worktime with only 5 hours downtime!

PROVE THE POINT TO YOURSELF! We'll be happy to go over the advantages of 88-B operation with you. Write Bucyrus-Erie Company, South Milwaukee, Wisconsin, Dept. 20E.

. . . for more details circle 292 on enclosed return postal card

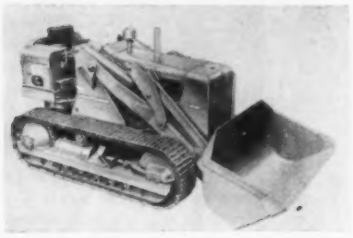


BUCYRUS ERIE®

Builds Better Equipment

New Products

(Continued from page 148)



Allis-Chalmers HD-6G Tractor Shovel with 1½-Cu. Yd. Curved Bottom, Bucket

9-ft. The new curved bottom bucket tips back 40° at ground level, with 21,500-lb. of pry-out force at the cutting edge. Shovel controls are hydraulic, with a heavy-duty gear-type pump, mounted directly to the front end of the engine crankshaft, thus eliminating the conventional universal joints and drive shaft. "True-Unit" construction permits removal and replacement of major assemblies without disturbing adjacent parts.

Available attachments for rear mounting include hydraulic ripper and a backhoe; those for front-mounting, include a rock bucket, rock fork, light materials bucket, lift tongs and lift forks, crane hook and straight and angling type dozers. These are mounted quickly by simply knocking out and replacing four pins.

Allis-Chalmers Manufacturing Co., Tractor Group, Milwaukee, Wisc.

For more details circle 156 on Enclosed Return Postal Card.

Five New Truck Cranes

Five new truck cranes from 35 ton through 80 ton capacities were recently introduced to the construction field by Harnischfeger Corporation. The largest, the 80 ton P&H 775A-TC, handles up to 250 ft. of boom. One of the features on this 80-ton rig is "Magnetorque," a P&H patented method of transmitting power electro-magnetically for swing. It is said to eliminate friction clutches, requires no lining replacements, adjustments or maintenance.

The new 35 ton P&H 555C-TC and 40 ton 565A-TC truck cranes are also equipped with "Magnetorque." Another feature of these machines is the completely sealed power box, announced by the manufacturer as a special design in which all gearing is completely enclosed and running in a bath of oil. The 35 ton truck crane will handle up to 180 ft. of boom while the 40 ton truck will handle up to 200 ft. Both the 40 ton P&H 585A-TC and the 60 ton 595-TC will handle up to 200 ft. of boom and employ the exclusive "Triple-Safe"

P&H 60-Ton, 595-TC Crane

P&H independent planetary boom hoist with one-directional cam clutches which are said to provide precise control and safety.

Harnischfeger Corporation, 4400 West National Ave., Milwaukee 16, Wis.

For more details circle 157 on Enclosed Return Postal Card.

A Floating Suction Strainer

The "Dolphin" floating suction strainer, here pictured, is designed for use with pumps that draw from streams, ponds, and sumps; or which are employed for de-watering mines, quarries, and excavations. By providing a dependable float which holds the strainer just below the surface, this device avoids drawing in either sand or silt from the bottom, or floating matter from the top.

Another problem to which the "Dolphin" is said to be adapted is the tendency for air to be entrained into pump suction due to vortex formation—frequently resulting in pump stoppage.

One of the difficulties in any attempt to combine a strainer with a float that sustains the weight of the hose is that the twisting action of the hose tends to turn the strainer out of its correct position or invert it altogether. In the "Dolphin" design this difficulty is said to be completely overcome by correct analysis of the balance and buoyancy of the parts, and by a freely rotating tube connection between the hose and the strainer body. The unit is made in four sizes, with connections for 1½, 2, 3, or 4-inch hose. The float chamber is filled with expanded polystrene "foam", which provides millions of separate water-tight cells, so that buoyancy cannot be lost as a result of accidental damage.

The "Dolphin" Floating Strainer

Megator Pumps & Compressors, Inc., 930 Manchester Ave., Pittsburgh 12, Pa.

For more details circle 158 on Enclosed Return Postal Card.

"Super-Roadpacker"

Designed to speed construction of highways and airports, the "Super Roadpacker" has been introduced by the Lima Works (Lima, Ohio) of Baldwin-Lima-Hamilton Corporation's Construction Equipment Division. It is claimed to reduce by 50 to 75% the time required to condense granular materials to smooth, solid, long-lasting foundations for concrete and bituminous pavements.

Compaction is accomplished by two 15-ft. rows of six vibrating shoes each—one row ahead of the vehicle's front axle, and one behind it. Hydraulically operated and controlled, the vibrating shoes can compact at varying widths by running in combinations of 4, 5, 6, 8, 9, 10, 11 or 12 shoes at speeds up to 2200 oscillations per minute.

B-L-H New Giant Compactor

Each shoe is fully sealed against sand and dust, permitting it to operate at full efficiency even if buried in loose sand. End shoes on cross tubes can be raised to reduce the machine's working width for use between forms or in other restricted areas. Gross weight is about 26,900 lb.

The vehicle can move over the highway at speeds up to 24 miles per hour and compact at any speed between 26 and 268 ft. per minute. It operates equally well in either forward or reverse. The four rear driving wheels are equipped with hydraulic power brakes and air boosters. The front axle features hydraulic steering. All wheels are equipped with high flotation sand tires.

Baldwin-Lima-Hamilton Corp., Construction Equipment Division, Box 449, Lima, Ohio.

For more details circle 159 on Enclosed Return Postal Card.

Pillow Tanks for Liquids

Increased demand for economical transportation and storage of bulk liquids has caused the Goodyear Tire & Rubber Co. to expand its line of collapsible "pillow tanks." These units are designed for the economical transport and storage of fuels, oils, water, and other liquids — especially under conditions adverse to rigid containers.

Advantages claimed include light weight, ease of handling (they can be rolled up when empty), elimination of "dead-heading" tanks, the fact that they can be used at temperatures as much

A Rubber-Coated Nylon Container which is Suitable for almost Any Liquid except Acids.

as 40° F. below zero or 165° above, and service life which has already been tested up to seven years. They are said to stand shocks in transportation better than the trucks carrying them. The main uses to date have been military and in the oil industries.

The pillow tanks are regularly available in capacities from 1100 to 13,000 gallons, have been built as large as 50,000 gal., and it is stated, can be made to hold up to 200,000 gal. A 10,000-gallon tank is 42 ft. long, 12 ft. wide and weighs 580 lb. when empty.

Aviation Products Division, Goodyear Tire & Rubber Co., Akron 16, Ohio.

For more details circle 160 on Enclosed Return Postal Card.

Conveying Equipment

A complete line of pneumatic conveying equipment for handling bulk cement and other free-flowing materials has been announced by Engineered Equipment, Inc. To convert an existing plant the manufacturer's engineers will design and construct from standard component parts a complete pneumatic bulk handling system. These components can be used with any pneumatic bulk cement truck equipment.

Pneumatic Bulk Cement Plant

Engineered Equipment, Inc., Waterloo, Ia.

For more details circle 161 on Enclosed Return Postal Card.

Steel Barricade

A new portable barricade, the "Protector", designed especially for quick on-the-spot use by vehicle drivers, is announced by Traffic Equipment Co. It is a collapsible, portable, reflectorized steel unit, measuring 6 in. x 40 in., equipped with a 7-in. battery-powered flashing light and supported by two 36-in. high collapsible stands. The unit folds into a 6 in. x 6 in. x 4 in. package for handy storage and comes with a protective canvas case.

Traffic Equipment Co., Dept. 4-D, 2064 S. Bannock, Denver 23, Colo.

For more details circle 162 on Enclosed Return Postal Card.

Portable Auger Drill

An improved portable auger drill claimed to be capable of drilling a hole in average soil has been placed on the market by J. R. Prewitt and Sons.

The new auger, called the "Prewitt Portable Auger Drill", weighs only 525 lb. and has pneumatic tires and timken

Prewitt Portable Auger Drill

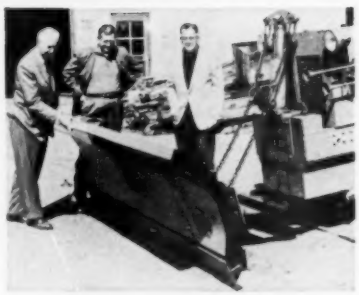
bearing-equipped wheels for easy moving from job to job. The feed screw and auger fold over during transportation to allow the user to get under low obstructions. The unit is small in size, but will bore holes 4 to 12 in. in diameter and up to 40 in. deep in most soils.

J. R. Prewitt and Sons, Department R, Pleasant Hill, Mo.

For more details circle 163 on Enclosed Return Postal Card.

Trip-Blade Snow Plow

A new trip-blade snow plow has been added to the line of Wausau Iron Works. It features a tripping subframe which clears obstructions without damage to plow or truck. Its advantage claimed over a tripping cutting edge is the ability to trip, even though the cutting edge is worn down.



New Trip-Blade Snow Plow

Other features of this new series of reversible and one-way trip plows are: full oscillation to follow road contour; easy adjustment for moldbard pitch; adjustable push plates to compensate for difference in truck frame heights.

Wausau Iron Works, Wausau, Wis.

For more details circle 164 on Enclosed Return Postal Card.

Materials Transporter

A new self-unloading dry bulk material transporter, the "Cement Transporter," Model BMC-T, has been announced by Dorsey Trailers. It has three 20-in. fill hatches with water-tight covers. Its twin screw discharge system

Bulk Cement Transporter Model BMC-T

unloads at the rate of 5 bbl. per minute. To dislodge lumps and prevent bridging over conveyor shields, the screws are reversible and each has four air pads. Two-stage drives permit discharge of the rear portion of the load before front screws are engaged.

Dorsey Trailers, Elba, Ala.

For more details circle 165 on Enclosed Return Postal Card.

Construction Saw

A new 10¼ in. power saw, the Model 510, introduced by Porter-Cable, is stated to have the extra capacity and power required for use in heavy construction such as mining, planking jobs, road and railroad maintenance. It is adaptable to all types of cuts from long rips to compound mitres. By using Porter-Cable abrasive blades, the 510 will cut many types of materials including iron, steel, and cement

(Continued on page 159)

Plowing an

- AIRPORT
- PARKING LOT
- CITY STREET
- or EXPRESSWAY—

Think of

FRINK

ONE-WAY with Trip Blade—for high-speed throwing and spreading, but windrows neatly at city speed.

REVERSIBLE Trip Blade — all-purpose; plows left, right, bulldozes ahead; power reverse lever in cab.

ROLL-OVER with Taper Blade—for air ports, expressways; rotates left or right in seconds; ends "deadheading."

The Plow Designed for the Power and Performance to Meet YOUR Snow Removal Needs

Whether snow removal problems in your area require a high-speed, heavy-duty V-type plow (**above**) or a lighter, maneuverable Reversible type, Frink has the plow specifically designed to do the job . . . faster, safer, at lower cost.

Frink, the pioneer in advanced snowplow design, makes four basic types of plow, each with models to fit 1½ to 12 ton trucks . . . and most are interchangeable on same truck attachment. Get full details from your Frink distributor or write Frink for descriptive folders about any of these plows —

For Snow Plow Know-How
It pays to think of

FRINK SNO-PLOWS

FRINK SNO-PLOWS, INC., CLAYTON, N. Y.
Eastern Steel Products, Ltd., Preston, Ontario-Canada

. . . for more details circle 319 on enclosed return postal card

CASE®

"420" Industrial Loader gets more push-power for faster digging with Torque Converter Drive

For a machine that weighs only 7,120 lbs., the Case "420" Industrial Loader packs a lot of power. It's billed as the only low-priced wheel type loader actually designed for production digging assignments. With 12,000 lbs. drawbar pull and 4,600 lbs. break-out force, the 15 cu. ft. bucket gets heaping loads on every pass, even out of hard-packed materials.

Secret of this amazing power is Twin Disc Torque Converter Drive

. . standard equipment on the Case '420." Compared to direct mechanical drives, the torque converter provides up to 56% greater push-power at the all-important working speeds.

As the load increases, torque output is multiplied through an infinite number of speed ratios to overcome load resistance smoothly and automatically. Since the engine is not lugged down, the 21-gpm hydraulic pump delivers full break-out power at all times. No tractive effort is lost due to tire slippage, because the slippage occurs within the torque converter.

In addition to boosting power, the torque converter's fluid cushion absorbs shock loads to prevent damage to engine and power train. There's no need for clutching during the digging operation, so operator efficiency goes up while the problem of clutch wear and replacement disappears.

Add all these features together and you get this answer: More dirt moved in less time and with far less effort. A test of the Case "420" Front-End Loader will convince you that Twin Disc Torque Converter Drive belongs on all your earthmoving equipment.

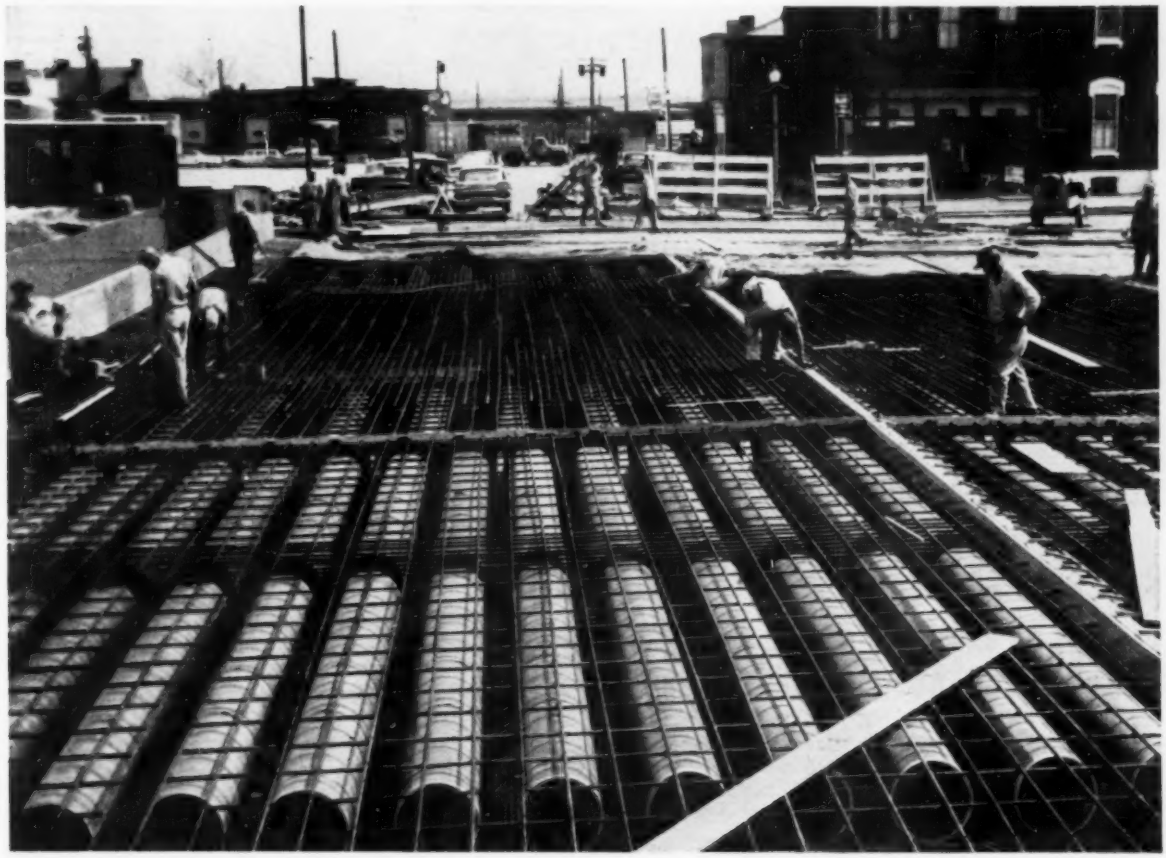
TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC
Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES OR SALES ENGINEERING OFFICES: CLEVELAND • DALLAS • LOS ANGELES • NEWARK • NEW ORLEANS

. . . for more details circle 365 on enclosed return postal card



saving concrete . . . reducing weight . . . maintaining strength with FIBRE TUBES and LACLEDE REINFORCING BARS

Millions of cubic yards of concrete are being poured into St. Louis' big new system of freeways—one of the most enterprising urban highway building programs in the country.

In this overpass section of the Mark Twain Expressway between downtown St. Louis and northwest suburbs, concrete and weight are both being saved without sacrifice of strength. 15¾"-diameter fibre tubes, inclosed in a grillwork of Laclede Multi-Rib Round Reinforcing Bars, form the core of the 24½"-thick deck. While volume and mass are substantially reduced, the Laclede-reinforced deck maintains full load-bearing capacity.

MISSOURI HIGHWAY DEPARTMENT
Project No. 1-70-5(23)242
Mark Twain Expressway, St. Louis Ave. Bridge
Contractor: Fred Weber Contractor, Inc.

LACLEDE

LACLEDE STEEL COMPANY

SAINT LOUIS, MISSOURI ◆ Producers of Steel for Industry and Construction

. . . for more details circle 339 on enclosed return postal card

CAN YOUR PLANT BIG AS IT MAY BE

PRODUCE AS MUCH CONCRETE AS THIS

This BUTLER Central Mixing Plant is simply the extremely portable HP-85 Ready Mixed unit with an additional section to accommodate two turbine-type, high speed concrete mixers.

Production? In excess of 200 yards an hour!

The batching cycles are completely automatic; only one man operates batchers and mixers.

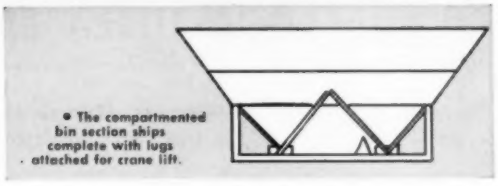
Where such capacities are not required, the BUTLER HP-85 can readily be built for a single turbine mixer.

The HP-85 is ideal for fast, efficient, low-cost batching in commercial ready mixed operations as a permanent plant — or as a unit that can be moved quickly and economically from job site to job site. The cost of erecting is only about a thousand dollars.

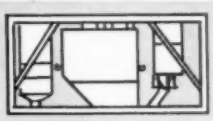
And of course, the HP-85 brings all its benefits to pre-cast and pre-stressed concrete operations.

Due to the BUTLER HP-85's remarkable portability, a growing number of ready mixed operators are using it to enter the Highway Program — using either agitating or non-agitating trucks.

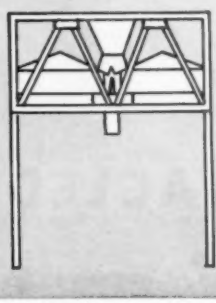
What are *your* plans? In any case, plan for the profit-making BUTLER HP-85.



• The compartmented bin section ships complete with lugs attached for crane lift.



• Batcher section is a complete unit with all piping, wiring, batchers and automatic controls in-place, ready for plug-in.



• Mixer section is also a complete unit with two turbine mixers, gates and controls pre-installed. Circuitry is completed with plug-in quick connectors. Support columns ship separately. These are quickly pinned to the mixer platform and swing into place as the mixer section is raised.

Here's the reason the HP-85 is erected at lowest cost . . . in hours instead of days

You'll want to know more about the BUTLER HP-85. Send for this illustrated Bulletin. Just write "HP-85" with your name and address on a postcard. We'll do the rest — promptly!

BUTLER BIN COMPANY

959 BLACKSTONE AVE. • WAUKESHA, WIS.

. . . for more details circle 293 on enclosed return postal card

New Products

(Continued from page 154)

Model 510 Heavy Duty Construction Saw

blocks.

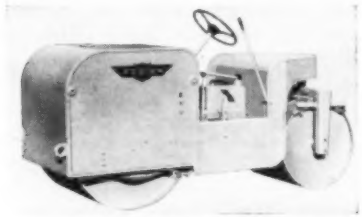
The Model 510 is powered by a 13-amp motor coupled with a helical gear drive, stated to be adequate for the toughest cutting jobs.

Porter-Cable Machine Co., 107 Seneca St., Syracuse, N. Y.

For more details circle 166 on Enclosed Return Postal Card.

2-Ton Tandem Roller

A new Essick Model 210 weighing in from 1½ to 2 tons is now available. The major improvements over the previous Model 200 are a lower profile and wider rolls which provide a lower center of gravity and a considerable increase in stability. This lower overall height increases visibility for the operator and adds functional styling to the roller.



Essick Model 210 Roller

The compression roll gives a 110-lb. per lineal inch compression. Sealed ball bearings on both the guide and compression roll eliminate all greasing in hard-to-get-at places. The Model 210 also features the Essick larger diameter guide rolls.

Essick Manufacturing Co., 1950 Santa Fe Ave., Los Angeles 21, Calif.

For more details circle 167 on Enclosed Return Postal Card.

Concrete Bonding Compound

A restoration compound for bonding new concrete to old, known as "Epoweld 812", permits the casting of thin layers of new concrete directly over the uncured material with the assurance that the new concrete will not break away when cured, even when feather edged. It is applicable also as a pavement notch spall filler, corrosion-resistant coating, crack and fissure welding material, and for the bonding of miscellaneous construction materials. "Epoweld 812" is an epoxy type product.

Coast Pro-Seal & Mfg. Co., 2235 Beverly Blvd., Los Angeles 57, Calif.

For more details circle 168 on Enclosed Return Postal Card.

Bin Level Indicator

A level indicator that shows the exact amount of material in a storage bin or silo is announced by Linco Products. The devices are installed vertically in series inside the bin or silo and are connected to lights mounted either on the outside of the bin or on a control

New Bin Level Indicator

board. The units can be installed in any type bin without modifications and no drilling or cutting of the wall is necessary. The indicator can be wired to stop the loading mechanism when bin is full and to start it when the material reaches a low point.

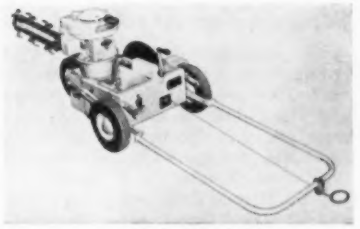
Linco Products, P. O. Box 144, Massena, N. Y.

For more details circle 169 on Enclosed Return Postal Card.

Utility Trencher

A new portable, self-propelled utility trencher, the "Davis Pup", is announced. It digs from 2-in. to 3-in. wide and down to depths of 3 ft. It is stated that once the unit has started trenching no operator is needed except for casual observation and to stop it.

A positive, variable speed drive with



"Davis Pup"

winching mechanism draws the "Pup" down the line to be dug. Six different speed settings as well as a neutral and stop-forward motion are controlled by a single lever. It will attain speeds up to 400 ft. per hour, according to the manufacturer.

Davis Mfg. Inc., 1301 South Handley, Wichita, Kans.

For more details circle 170 on Enclosed Return Postal Card.

New Loader and Backhoe

The International Wagner No. 465 loader and No. 65 backhoe, built for sustained heavy-duty loading and trenching operations, now are available for use with the new International T-340 crawler tractor.

With a rated capacity of 3,500 lb. at full lift, the low profile No. 465 loader features an automatic hydraulic self-leveling action which enables the bucket to return from full dump height to a pre-set digging angle, using boom control only. Its 64-in. wide bucket has a capacity of ⅝ cu. yd. struck to ⅞ cu. yd. fully heaped.

The No. 65 backhoe digs and maintains trench grades up to a depth of 10 ft. It can dig efficiently at right

T-340 Tractor with No. 465 Loader and No. 65 Backhoe.

angles to the tractor, with a full 180° arc of swing. Individually adjustable stabilizers provide easy leveling on grades or rough ground. It also features a complete line of bucket sizes and types, a multi-purpose seat used for both tractor and backhoe operation, and quick-mounting and detachment.

Harvester's new International T-340 is a 31-drawbar horsepower crawler powered by a 4-cylinder gasoline engine with 135-cu. in. displacement. Weighing 5,600 lb., it has five speeds forward, one in reverse and a speed range of 1.5 to 5.9 mph., with 66 in. of track on the ground.

International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

For more details circle 171 on Enclosed Return Postal Card.

White's Tandem-Axle Line

The complete new line of White tandem-axle construction trucks, engineered to provide maximum payload and durability in all ready-mix concrete and materials-hauling operations, embodies more noteworthy features than can be stated in a current new product item. Both long experience and current research have contributed to this result.

The new trucks, for use with dump bodies, dump trailers, concrete mixers flatbed bodies, and other specialized types, are offered in four model designations, both gas and diesel, from 35,000 to 75,000 lb. GVW. A wide range of component options, under White's "unit option plan," permits tailoring the chassis, engine, transmission, and axle combinations of each model to the exact requirements of the operator.

Rear view of a new White construction truck, showing tandem-axle with double-channel heat-treated chrome manganese frame, all-bolted construction, tubular cross members, and alloy cast steel and malleable iron frame brackets.

Construction model designations are the medium-weight White 2064, which can be engineered for GVW of 35-40,000 lb.; the White 4264, for 40-75,000 lb. GVW and 5 to 10 cu. yd. mixer capacities; the White 4464D, for 43-75,000lb. GVW and 6 to 9½ cu. yd. mixer payloads; and the White 9064, a 90-in. bumper-to-back-of-cab truck for 45-75,000 lb. GVW and mixer capacities of 5½ to 10 cu. yd.

The 4464D utilizes White diesel engines, the other models White Mustang gasoline engines. The diesels range from 180 to 220 hp—the Mustangs from 145 to 215 hp. Throughout the four model designations, the standard transmission is five-speed with three-speed auxiliary. A complete range of five-speed transmissions and auxiliaries to fit every operation is available.

The White Motor Co., 842 E. 79th St., Cleveland 1, Ohio.

For more details circle 172 on Enclosed Return Postal Card.

Compression-Tension Machine for Field or Lab.

A new portable combination compression-tension machine announced by Soiltest, Inc., is designed to test

Portable Compression-Tension Tester

concrete cylinders or reinforcing bars in either field or laboratory. Compression capacity for 6" diameter standard concrete cylinders is 200,000 lb. The hand operated tester is entirely self contained. No pressure or electrical connections are required.

The machine is also designed for testing speciments in tension up to the 100,000-lb. load capacity. This makes it possible to test concrete reinforcing bars or small structural steel sections on the jobsite. Tension grips are included. Accessory equipment can be added for beams in flexure and cubes in compression. Test loads are developed by a two-speed hydraulic pump. Total weight is 500-lb.

Soiltest, Inc., 4711 North Ave., Chicago 39, Ill.

For more details circle 173 on Enclosed Return Postal Card.

Warning Flasher

A new dome-head flasher warning light, with full 360° visibility, is being introduced by Pacific Mercury, in transistor-neon or transistor-incandescent models, and with or without PM's patented "Solarstat" which automatically turns the light on when the sun goes down, off at daybreak.

Pacific Mercury's New Flasher

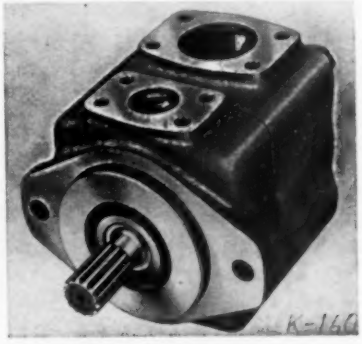
The flash rate is adjustable. Battery life is said to extend up to six months. Extra thick, optical quality "lucite" lens is rated shatterproof, and increases visibility. A threaded insert on the housing permits simple, one-bolt attachment to a standard or barricade.

Pacific Mercury, 14052 Burbank Blvd., Van Nuys, Calif.

For more details circle 174 on Enclosed Return Postal Card.

New Hydraulic Pumps

A new Series 45 "High Performance" vane pump, announced by Vickers Incorporated, is designed for normal operation at speeds up to 2,000 rpm and pressures to 2,000 psi. It is stated to provide more hydraulic horsepower output in less space and at less cost per horsepower and is expected to have wide application on material handling, construction and similar mobile equipment.



Series 45 Vane Pump

Three models of the series deliver 52, 63 and 75 gpm at 2,000 rpm 2,000 psi. At 1,200 rpm 100 psi (SAE rating) delivery is 34, 41 and 48 gpm with the same units. Pumping cartridges are field replaceable in ten minutes without removing the pump from its mounting.

Vickers Incorporated, Detroit 32, Mich.

For more details circle 175 on Enclosed Return Postal Card.

Rubber Contractor's Pail

A 12-quart contractor's pail, the "Fortex N100-12", is made of one-piece molded rubber reinforced with fabric for heavy duty and abuse in service. It is said to be nearly indestructible. If cement hardens in it, a simple tapping will loosen it and let it fall out in one piece.

Cauchotex Industries, Inc., 44 Whitehall St., New York 4, N. Y.

For more details circle 176 on Enclosed Return Postal Card.

Mine Roof Bolts Find Constuction Uses

Device developed for mine work is saving money on road and other projects in a variety of ways.

The mine roof bolt, long familiar to coal miners, is finding uses in construction. Republic Steel Corporation's Bolt and Nut Division, has outlined some of these.

Mine roof bolts are from 14" to 8' long or longer, and have wedge-like anchoring devices on the ends that are driven into rock or concrete holes drilled for the purpose. On the exposed ends nuts are placed over plates and washers and tightened. The more the nuts are tightened, the more secure and deeper the anchoring. A single bolt of high strength steel, depending upon its diameter, can support a tension of 40,000 lb. or more.

Before mine roof bolts, a mine tunnel was a forest of overhead beams and vertical pillars. Similar simplification of many construction tasks is seen.

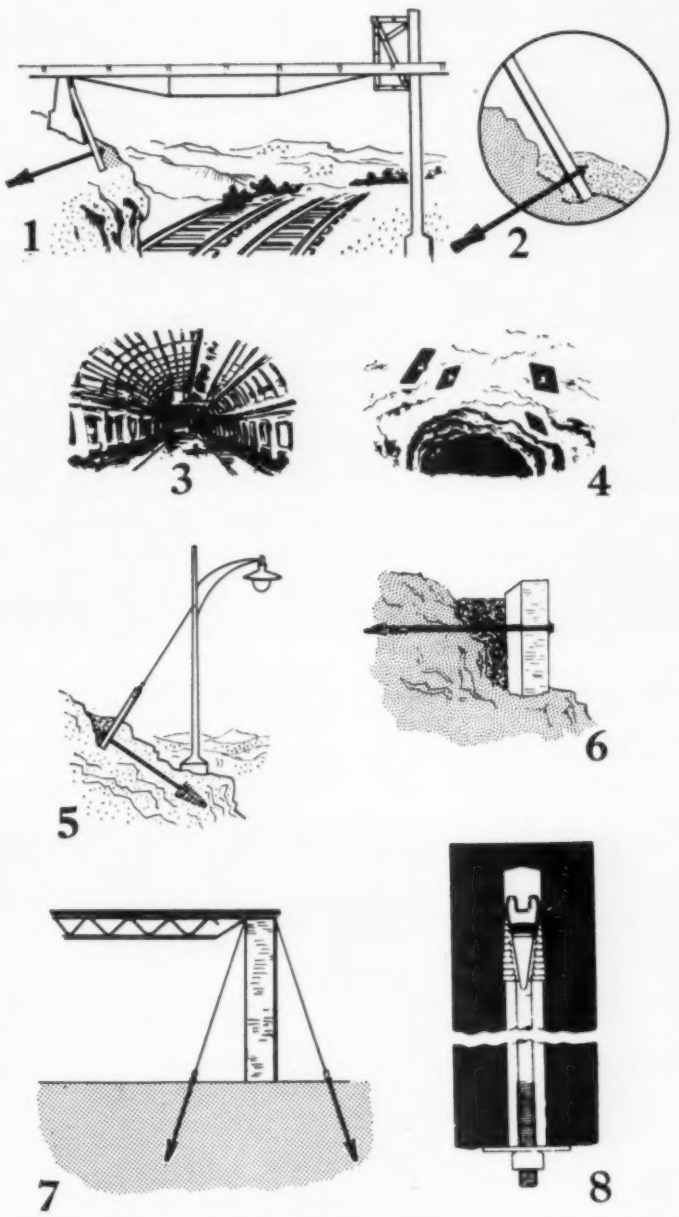
The bolts have been used above ground to anchor pipe supports into rocky outcroppings; the support, in one instance, helped to carry a heavy drain pipe over railroad tracks.

• A similar use provided anchorage for guy wires for tall poles and towers.

• The bolts have anchored structural members into rock, for scaffolds and brackets. Wherever there is a rocky cliff or outcropping, and it is possible to drill a hole, a mine roof bolt can be installed.

• In non-mine tunneling, mine roof bolts are serving to "stitch" the tunnel's interior surface back into the surrounding solid mass of rock through which the tunnel is bored. In a mile of tunnel driven through a mountain, engineers may use as much as 250 tons of roof bolt material. But they may also save hundreds of thousands of dollars of construction costs—and spare workmen the serious hazard of falling rock.

• Another fertile field for the bolts is use as stays or supports for concrete slabs in foundation work. This can be new construction, particularly in the vicinity of natural rock.



• **Some typical non-mine applications for mine roof bolts, as reported by Republic Steel, include: (1) and (2) Anchorage for a trestle carrying drain pipe over railroad tracks. (3) and (4) Water or drain tunnel drilled through a mountain, showing, at left, the maze of wooden shoring required for conventional construction. (5) Anchorage for a street light or floodlight in rocky terrain. (6) Anchorage for a building wall next to a rocky outcropping. (7) For guy wires giving extra support to a foundation wall threatened by flood or high wind. (8) Cross-section of the mine roof bolt's extreme ends, showing, at the top: the wedge-shaped gripping device which enables the bolt to fasten itself into rock or concrete with increasing firmness as pull on the bolt is increased.**

• It can also be an existing structure. Contractors have used them to bolster sagging walls, save flood-ravaged buildings, or to fasten one part of wall or foundation to another part.

Highway Lighting

Scale Models Serve Research Lighting

Nighttime lighting of highway intersections is being studied with the use of scale models by traffic engineering researchers of the Texas Transportation Institute. They are being aided in the work by architectural researchers of the Texas Engineering Experiment Station.

The lighting studies are being conducted in the interest of highway effectiveness and safety.

The models include miniature signs, trees, shrubs, curbs, and various other elements which are found at the actual site. They are lighted with small electric lights that simulate the street lamps in use.

Use of the model technique in highway lighting studies enables more accurate and comprehensive data to be obtained conveniently and economically, the researchers feel.

The first intersection placed under study is that of the Texas City wye formed by States Highways 3 and 146. Before and after studies of illumination installed are being conducted with a model 8 by 8 ft. in size and constructed to a scale of 1 in. equals 5 ft.

Work is being accomplished on the problem of reproducing standard highway lighting patterns using miniature lights. By utilizing Rheostat and a combination of several lenses, the theoretical pattern and intensity for a typical highway luminaire has been reproduced. A luminaire will be installed at the laboratory for measuring patterns and intensities for luminaire positions other than standard and an attempt will be made to reproduce these results.

"SPANALL" ACQUIRED BY CHAIN BELT: Purchase of the entire operations for distributing Spanall products in the Western Hemisphere from the Universal Builders Supply Company, Inc., of New York City has been announced by Chain Belt Company, Milwaukee. The announcement was made jointly by W. C. Messinger, vice president of Chain Belt's construction machinery section, and J. R. Strassburg, treasurer of the company.

Spanall equipment consists of a series of adjustable structural steel girders of patented design, column clamps, and various types of vertical shores for use in poured concrete construction, including buildings, roads and bridges.

● Viewing a model of the wye intersection of State Highways 3 and 146, at Texas City. The model is being used in a research study of nighttime lighting.

Job Safety

Oiling, Adjusting, and Repairing Cranes

By Earl W. Wheeler
Bureau of Yards and Docks, U. S. Navy

Unsafe practices in oiling, adjusting, and repairing cranes result in a large proportion of the total injuries involving cranes on construction work. Most of these injuries are caused by falling from the crane or getting the hands or clothing caught in moving parts. Inadequate cribbing accounts for many of the most serious accidents.

Rigid observance of three simple rules will prevent most of these injuries:

7. Never oil, adjust, or repair a crane while the engine is running, *unless it can be done in no other way.*

2. Exercise special care in climbing on or off the crane to oil, adjust, or repair parts. Don't jump off the crane.

3. Use only substantial, stable timber cribbing or steel supports designed for this purpose when dismantling or assembling booms or when performing similar work on cranes, Do *not* use oil drums, saw horses, or scantlings standing on end for this purpose.

The first rule is simply common sense. Why take a chance on getting caught in moving parts if the engine does not have to be running while oiling, adjusting, or repairing is being done? This is a well accepted rule which applies to any and all machinery. Some adjustments, such as engine tune-up, can only be done while the engine is running. Hence, the phrase, ". . . unless it can be done in no other way."

The second rule applies, of course, to climbing on and off any equipment. However, it is especially important on cranes because many of the points at which oiling, adjusting, and repair have to be done are well above the ground, and frequently are not easily accessible. Never *jump* off a crane unless it is a matter of life or death. The old-time seamen's rule of "one hand for the ship, and one for yourself" may often be a good rule to apply when oiling, adjusting, and repairing cranes.

The third rule is not only a life or death matter to the man—failure to observe this rule often results in severe damage to the crane. Many

a boom has been ruined and many a man crushed to death because inadequate cribbing was used. Insist on substantial cribbing!

—From "Construction Hints," National Safety Council

"Let's Eliminate Accidents"

(A message by Peter Kiewit to the staff of Peter Kiewit Sons Co. and subsidiaries, published in this firm's employe magazine, "Kie-ways").

It is a pleasure to report to you that we had fewer disabling injuries on our construction projects in 1958 than in 1957. The number of disabling injuries for each million manhours worked dropped to 15.16. This is 23% below the average for the construction industry as reported by the National Safety Council!

Although we are making progress in this vital area of responsibility, I am sure we all agree that there are still too many avoidable accidents resulting in personal injury and unnecessary damage to equipment and property. Our goal should be to eliminate all accidents, and we can go a long way toward accomplishing this goal with your help.

I am especially concerned about the number of serious accidents involving the operation of trucks and heavy equipment. Supervisors must spend the time necessary with new employees to explain our policies related to safe and efficient operations and do a better job of determining the competence and dependability of operators before turning equipment over to them. Whenever practical, new truck drivers and other equipment operators should be checked out by a competent instructor or supervisor. Operators and drivers must follow safe practices consistently and without exception. Men on the ground around moving equipment must remain alert.

It is my hope that we can report further gains in accident prevention at the end of the 1959 construction season. To do so will require the active interest and cooperation of each of you.

POWER CURBERS, INC., of Salisbury, N. C., headed by John S. Henderson, President and Treasurer, has taken over the former E. L. Hardin Associates, Inc., manufacturers of Stephens-Canfield Automatic Curbers and Smith-Field Automatic Curb and Gutter Machines. The company will continue to manufacture the machines at the present plant location.

Advance Check Can Cut Job Insurance Costs

The contractor today often finds value in a service offered by some insurers, the pre-bid survey. The over-all purpose, according to Otto Holmskog, construction specialist for Employers Mutuals of Wausau, Wis., is simply to obtain for contractors a fair insurance premium rate, and then protect that rate by keeping accidents at a minimum.

The pre-bid service becomes more and more significant to contractors as bidding becomes more competitive, Holmskog points out. Many contracts have been lost on the basis of being as little as one per cent off, which means that a miscalculation on insurance costs could lose a job.

The mechanics of most pre-bid surveys involve a review by the insurer's safety engineers of job plans and specifications, visits to the job site to relate plans and specifications to problems that may be encountered, and then transmitting a report to the underwriting department that will be used as the basis for evaluating insurance costs fair to both contractor and insurer.

Holmskog, whose firm has insured such heavy construction projects as the St. Lawrence Seaway, the DEW line in Alaska, and the Great Salt Lake "fill," says that the following are major factors to be considered in making a survey:

1. The locality, geography and population of the area, as well as the proximity of private property.

2. Engineering factors such as type of construction involved and weather conditions.

3. Accessibility of the area being worked and extent of area covered. There is a great problem in highway construction, for instance, because of access points, distance and re-routing of public thoroughfares. Near St. Louis, for example, a handicap—and potential hazard—faced by Fred Weber, Inc., contractor, and Employers Mutuals of Wausau's specialists, was the continuing flow of traffic paralleling construction of Interstate Highway 44. Pre-bid surveys are helpful in anticipating the potential problems and costs involved in such a situation. The pre-bid survey on this project disclosed that the largest blasting job, a 32 foot face of rock, was within six feet of Highway 66, open to regular traffic and requiring special safety precautions.

● 4. Establishing an agreement of what methods and controls will be used by the contractor. Every job is different and has its own "personality," with tailor-made plans devised for each on an individual basis, although there are certain basic safety rules to be followed on all jobs.

5. Size of the job and number of workers.

On the basis of information developed from these factors, says Holmskog, evidence accumulated in the pre-bid survey can give a contractor greater confidence in his ability to do a good job at a profit, as well as guarding him against pitfalls to be avoided. Thus, he declares, contractors can benefit greatly by asking their carriers for pre-bid surveys and insurance rates for jobs on which they plan to bid.

Variable-Height Pier Designed by Army

A variable height pier for use in speeding the erection of tactical bridges and to reinforce civilian bridges for military loads, has been developed by the U. S. Army Research and Development Laboratories.

Designed for a maximum height of 100 ft., the pier can support 150-ft. span truss tactical bridges with a 100-ton eccentric load totaling 275 tons.

The pier consists essentially of columns of various lengths, bracing, and top and bottom grillage. Much of the bracing is made from pipe, and other parts are of standard structural rolled steel shapes. All connections are bolted.

AGC Outlines Disaster "Plan Bulldozer"

The construction industry's plan for helping during disasters (floods, storms, fires) is outlined in a brochure, "Plan Bulldozer," written for contractors, government authorities, other construction industry organizations and the public.

Since construction is the largest production activity in the nation, the forces of this vast group, properly organized and employed, can make an effective contribution to the survival and recovery of a community. The brochure, prepared by the Associated General Contractors of America, represents over 7,200 of the nation's leading construction firms of all types.

Endorsement of the industry's disaster relief "Plan Bulldozer," has been received from civil defense and other government officials. The Office of Civil and Defense Mobilization has requested 15,000 copies of the brochure to distribute to regional, state and local civil defense authorities, and for use by approximately 2,000 defense executive reservists who attend the OCDM staff college each year.

An additional 15,000 copies are available to the managers and secretaries of the 124 AGC chapters and branches, to contractors, and to organizations allied with the industry. The booklet is a guide for local chapters in setting up disaster-relief staffs to administer and coordinate the many factors involved in a well-organized plan. Participation in the plan is open to all contractors and construction industry groups, whether affiliated with the AGC or not.

The plan calls for participating contractors to list the amount and types of equipment and the personnel they could have available. Also listed staff will then be able in short notice to call on the combined resources of the construction industry in a locality.

These records will be filed with government agencies and coordinated into the master relief and rescue plans for the area.

To provide for all eventualities a special form of public liability and property damage insurance is available from stock and mutual insurance companies, at nominal rates, to all contractors participating in disaster relief plans.

The "Plan Bulldozer" brochure is available on request from Publications Manager, The Associated General Contractors of America, Inc., 1957 E Street, N.W., Washington 6, D.C.

PAUL MACY, DIRECTOR OF PAVING MATERIALS SALES for Allied Chemical's Barret Division, retired on July 31. Macy, who has traveled the highways and byways of the land for more than 40 years and can trace the evolution of highway paving equipment from horse-drawn water carts to the highly mechanized equipment in use today, graduated from Cornell University in 1913 (civil engineer). He spent five years with the New York State Highway Department before joining Barrett in 1918.

Contractors to Participate-

BROAD RESEARCH EFFORT LAUNCHED BY OHIO AGENCIES

Rising interest in cooperative research at the state level is reflected by the far-reaching program being mapped in Ohio.

Formation of the Highway Research Council of Ohio has been formed to encourage research activities in the state. Membership is from the state's department of highways and Ohio State University's College of Engineering.

The university will offer the services of authorities in such fields as soils, construction materials, highway design, electronics, nuclear energy, and photogrammetry. In addition, for studies in various areas allied to highway engineering such as traffic safety, driver behavior, and administrative management, other university faculty members will be available. These will include such departments as psychology, preventive medicine, economics, business organization, etc.

Council representatives are highway director Everett S. Preston, chairman; dean Harold A. Bolz, of the state college of engineering, vice chairman; prof. Robert F. Baker, director of civil engineering research at Ohio state, secretary; G. A. Berry, assistant director and chief engineer for the highway department; Robert S. Green, associate dean of the college of engineering and executive director of the experiment station; and prof. Emmett H. Karrer, of the Ohio state college, department of civil engineering.

The state department of highways will cooperate by supplying instruments for field work and by coordinating field demonstrations with laboratory work. Ohio's highway equipment manufacturers and material producers are expected to cooperate. And the Ohio Contractors Association, whose members feel that they have much to gain as well as to contribute, has appointed a committee to work with the council on aspects of job quality control.

Other studies being considered include such subjects as highway traffic accidents, highway economics, slope stability, and processing of aggregates for pavement construction.

● *Nuclear Methods.* The council plans to give special emphasis to possible uses of nuclear energy in the highway construction field. Some of the studies considered are for use of—

1. Reflection thickness gauge to determine thickness of paint and other coatings on various highway materials.
2. Trace radioisotopes to determine the rate of wear or service life expectancy of materials, such as traffic paint and surfacing materials.
3. Radioisotopes to produce luminous paints for traffic and information signs.
4. Radiography to locate steel reinforcing and/or voids in 12-in. to 18-in. thick concrete beams and slabs, development of reflection thickness gauges capable of determining the exact thickness of concrete and bituminous surfaces.
5. Nuclear density determination devices to ascertain the quality of in-place concrete.
6. Radioisotopes in construction to determine the minimum mixing cycles for portland cement and bituminous mixes.
7. Trace radioisotopes for determining water flow paths in relation to structures; the movement of moisture in soils, penetration and retention of soil additives (such as calcium chloride).
8. Present nuclear moisture determination devices to ascertain the effectiveness of concrete curing compounds.
9. Trace radioisotopes to study absorption of fertilizer and inhibitors by roadside growth.
10. Radioisotopes to make quantitative measurements of the corrosion of embedded steels.

Here's a preview of the display you will see when you drop by our booth to discuss your paving and surfacing problems. See *US* in Seattle, for the latest information on asphalt paving and surfacing.

We're looking forward to reviewing with you many of the new developments in Bitumuls pavement constructions and treatments.

For well over 30 years American Bitumuls & Asphalt Company has been closely associated with the roadbuilding industry. As leading marketers of asphalts, cut backs and emulsions, we will continue to deliver the highest quality products backed by the finest service available nationwide.

Of special interest to many will be the new Cationic Bitumuls test-kit (above). See for yourself the amazing rapid set of this new binder on siliceous material.

American Bitumuls & Asphalt Company

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Bituminous
ROADS AND STREETS

Bituminous Contractors Adopt Million-Dollar Research Program

The ambitious quality-improvement program outlined at Miami last winter was formally initiated at the NBCA's summer meeting last month.

Special to Roads and Streets

A nucleus of quality conscious paving contractors assembled at White Sulphur Springs, W. Va., last month to hear a progress report on the ambitious program launched by the National Bituminous Concrete Association. (This program to step up quality of bituminous construction was reported in Roads and Streets, March, 1959.)

The occasion, which was the association's mid-year Board of Directors and Governor's meeting drew a large attendance from the rank-and-file membership to discuss tactics for implementing the bold program. The delegates gave solid assent to plans for advancing research and encouraging tighter quality control measures, both moves designed to produce top quality bituminous pavement and strengthen the industry's competitive position.

Major news break from the NBCA was the announcement that the organization will invest $1 million in concentrated research effort. One of several basic projects to be undertaken now is a literature survey of all existing material published to date on bituminous concrete paving. However, previous to undertaking such a full scale survey, the Association has elected to make a pilot study on a definite segment of this available literature in order to assure that the procedures being used meet the needs of NBCA and to obtain reliable cost estimates. The Association has accepted a proposal by Miller-Warden Associates, of Swarthmore, Pa., to make such a pilot survey of all Highway Research Board publications from as far back as 1942. This preliminary survey will be completed in time for evaluation by Association members during their annual meeting in Detroit next February.

The Board announced that the undertaking would be continued over a five-year period and that funds would be invested in research projects to the tune of $150,000 the first year, $200,000 each of the second and third years, and $250,000 each for the fourth and fifth years. NBCA's new research coordinator, Charles Foster, formerly flexible pavement expert with the U. S. Corps of Engineers, was instructed to develop a priority program so the association could determine which projects to begin each of those years. According to Executive Director H. Keith Griffith, top priority efforts will probably be given to studying compaction and the effects of mixing time and temperature.

In addition, the Board announced that a special foundation would be formed shortly to finance the research program.

● *Quality Conscious Contractors.* Prominent contractors attending the meeting indicated their support of the 10-point quality improvement program. Why should contractors be so concerned about design and control? Typical reply was that of Paul Blouin, district manager of the Lane Construction Corporation of Meridan, Conn.

"Ordinarily, product improvement in the construction field comes from the engineering side, the agencies that write the specifications. But the situation has become so competitive that we're going to take some initiative here."

"Why not contractors?" retorted another eastern roadbuilder. "We're engineers. We know what good pavement should be!"

John Kelly, NBCA president and partner of the Imperial Paving Co., Oklahoma City, declared, "Contractors are right in the middle of this thing. We know that specification writing in this field hasn't kept pace with equipment development. We know that there can be considerably more uniformity in bituminous pavement design. It takes a quarter of a million dollars to assemble a good paving equip-

ment outfit, the kind of machines and plants necessary to please engineers in states A, B, and C. We've got to have a high volume of work to make that kind of investment pay off. We won't get that volume unless we can help discover the ideal designs and the ideal production procedures. Frankly, this is a dollars-and-cents proposition for us.'

C. B. Wuertenberger, vice president, Rea Construction Co., Charlotte, N. C., expressed the feelings of others, "Quality improvement is a contractor proposition. Let's face it, most of all it is a matter of the willingness of contractors to do what's right."

Executive secretaries of NBCA's 24 state chapters were present and told the Board that the program, which was first proposed in August, 1958, and outlined in February, 1959, has won widespread endorsement among their contractor members.

"The industry was ripe for this move," one Midwestern chapter representative said. "We know it's going to cost us money, but we know, too, that five years of intensified research is bound to produce a better product. And with a better product, there's no doubt about our ability to hold onto a good chunk of the highway market."

● *Complex Machinery No Panacea.* Representatives of major equipment manufacturers attended the gathering and offered their help in certain research areas.

Ed Holt, vice president in charge of sales for the Barber-Greene Company, commented, "It is obvious that the bituminous paving industry needs some very basic facts of life. When 50 different states have nearly as many different ideas of how long to mix asphaltic concrete, it's apparent that the final answer is still to be found. In such a situation, there is no real incentive for manufacturers to design equipment capable of higher speeds, for example. The contractor may go for it, but the engineer won't let him utilize it."

Mr. Holt and other equipment representatives at the conference cautioned the NBCA Board against pinning all their hopes for quality improvement on new machine designs or innovations.

"Don't fall into the trap," he said, "of looking to equipment innovations as a panacea to poor field practices. The equipment industry can give you anything you want. We can give you cold-feed systems with variable speed controls, more feeders, and driers with the most elaborate temperature regulating systems. But these things will all cost you money, and that cost you must pass on, in turn, to the highway departments.

"Present equipment with reasonable improvements, you will probably find, is capable of producing the end-product you want. You have got to couple your recommendations in this area, with recommendations for uniform specifications based on sound scientific research, and with a drive for stricter quality control by the contractor himself on every individual project.

Other delegates had similar sentiments. Quality improvement may lead in time to the equipment manufacturer's design laboratory, but it has to begin on the contractor's job today, they said. Existing machinery, plus good aggregates, plus conscientious control by the contractor, can produce more-than-satisfactory pavement.

It would help to take some of the "hocus-pocus" out of bituminous pavement design, according to Larry Glasser, of Littleford Brothers, Inc., Tampa, Fla. "We need to get out of the Dark Ages era where everyone has his own mysterious prescription," he said.

Huge Tow of Asphaltic Products

The largest tow of paving asphalts reportedly ever made on the Mississippi River has been completed to supply the new American Bitumuls & Asphalt Company's new terminal facilities at St. Paul, Minn. from their Mobile, Ala. refinery.

Pictured here, just north of Baton Rouge, La., near the start of its long trip, is the M/V "Bayou Lacombe" with three insulated cylindrical tank barges and four semi-insulated barges loaded with nearly 3,000,000 gal. of Chevron asphalts and Bitumuls' emulsified asphalt—enough to surface more than 100 miles of 2-in. thick, 24-ft. wide road.

Soil-Bituminous Base Course Specification

The ninth of a series of Standard Specifications for Public Works Construction has been recently issued by the American Public Works Association. The new specification (I-59), is for Soil-Bituminous Stabilized Base Course for Roads and Streets. It was prepared by the association's committee on soil stabilization, headed by Harold F. Clemmer, engineer of materials and standards, District of Columbia department of highways.

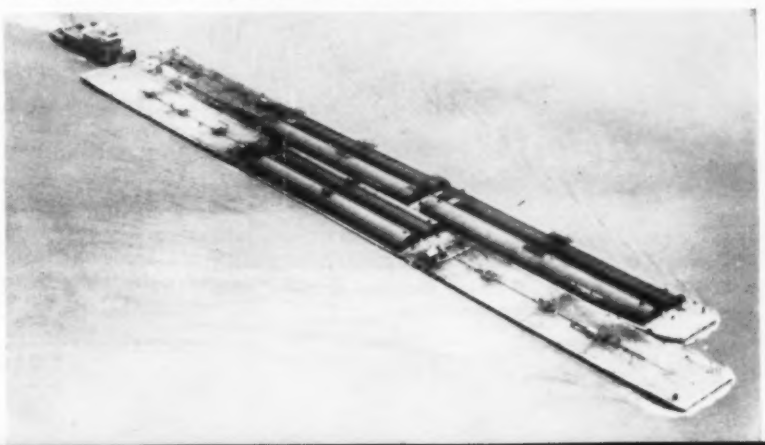
Other members of the committee are: William D. Monroe, city engineer, Jackson, Mich.; Vernon C. Peebles, chief engineer, Raleigh, N. Car.; Carl C. Fagerlind, commissioner of streets of Waterloo, Iowa; E. H. Lindstrom, asistant city engineer, Seattle, Wash.; Carl A. Distelhorst, engineer-in-charge, street construction, Milwaukee, Wis., and Reuben S. Rountree, director of public works, Austin, Texas.

This new 10-page specification is priced at $1.00 per copy. Members of the APWA are allowed a 40 percent discount on prices listed and an additional 10 percent discount if payment accompanies order.

INTRODUCTION TO THE DYNAMICS OF FRAMED STRUCTURES. By Grover L. Rodger, Sc. D. Director, Department of Engineering Science, Florida State University. 360 pages, cloth binding; Price $10.25.

Written by a structural engineer using a model analysis viewpoint, this introductory treatise applies the theory of structural dynamics primarily to buildings and bridges. It helps toward a better understanding of stresses in structures during and following earthquakes, explosions, and related phenomena.

● **Asphalt afloat—enough for 100 miles of road.**



Virginia's Design Program for Flexible Pavements

Bringing into focus the entire design procedure, which begins with a thorough analysis of the foundation and its supporting value. This systematized approach also takes into consideration the traffic weights and volumes, and the availability of suitable materials within economic hauling distance.

By A. B. Cornthwaite

Testing Engineer, Virginia Department of Highways

● **Soil investigation crew taking samples—a "must" step in Virginia's road design procedure.**

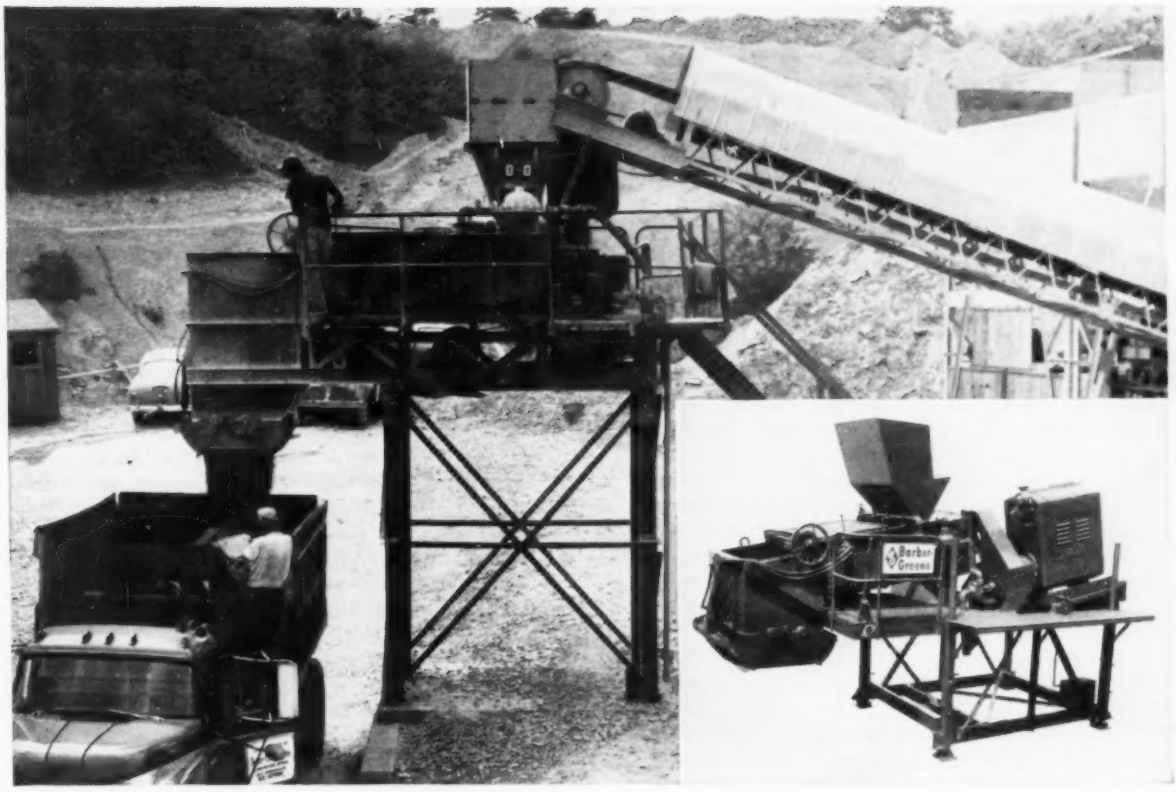
A formidable problem today is to determine an acceptable pavement design, suitable for all types of traffic, under all weather conditions, and economically feasible within specific fund allocations. This problem is made more complex by the development of expressways, and more recently the Interstate system of roads.

Past experience, while always a most valuable adjunct, is not necessarily adequate today, because of the rapidly changing traffic patterns on all types of highways. Vehicular speeds, volume, wheel and axle loads, tire pressures, certain geometric designs, and the multiplicity of possible combinations of the component parts of the pavement structures—all these factors make pavement designing for the roads of tomorrow a most challenging and absorbing task.

In general, pavement designs are considered to be of two categories, flexible and rigid. There is much to recommend the choice of either type, and in the majority of cases the decision to select one type or the other is made on the basis of sound engineering judgment, full consideration of the economics involved, availability and suitability of materials, anticipated performance, and with due respect for the needs of the area and persons who will utilize the facility. Comparisons of the merits

ABOUT THE AUTHOR—

Mr. Cornthwaite is chairman of the American Society for Testing Materials Committee D4 on Road and Paving Materials, and member of ASTM's board of directors; vice-chairman of the Highway Research Board's Department of Materials and Construction Bituminous Division, and vice-chairman of the Committee on Materials of the American Association of State Highway Officials.



One of the many high capacity Barber-Greene Model 828 Stabilization Plants now setting production records. Inset shows new Model 824.

New Barber-Greene Stabilization Plants provide record-setting capacity and economy

Cost-conscious contractors everywhere are meeting increased demands for base material with new high-capacity, low-cost Barber-Greene Stabilization Plants. These plants require less equipment and labor than "on-the-road" mixing methods . . . deliver greater accuracy in proportioning and water content . . . are less dependent on weather . . . consolidate material-handling.

Model 828 exceeds highest tonnage requirements of modern highway construction . . . new Model 824 offers ample capacity for applications where extremely high tonnages are not required, plus all the cost-cutting advantages of the Model 828.

Record production—many plants are producing over 600 tons per hour.

Twinshaft pugmill—assures fast, high-capacity mixing. Paddle tips are reversible, last longer.

Low maintenance—material forms its own mixing chamber . . . no liner plates to replace.

5-ton surge hopper—speeds truck loading . . . hydraulic clamshell discharge gate prevents segregation.

Adjustable dam gate—controls mixing time without changing capacity.

Easy erection—bolted structural support frames.

Wide variety of fines and aggregate feeding systems available. Diesel or electric power.

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of the two types is not intended here. Rather, a program for the design of flexible pavements based on the above factors which has found high favor in Virginia from the standpoint of performance, economy, and availability of materials will be discussed.

● Virginia is one of the few states whose state highway department builds and maintains all of the roads within its boundaries. Some 49,000 miles are included in the Primary and Secondary Systems. There are approximately 41,000 miles in the Secondary (rural, or farm-to-market and sub-division streets) System and about 8,000 miles in the Primary System. Virginia also has its fair share of the Interstate System with 1,007 miles within its boundaries. This large mileage coupled with a long-standing policy of "pay-as-you-go" has taxed the ingenuity of the engineering branch of the highway department to the utmost. Full consideration of all possible locations and other preliminary engineering data, studies of available materials for competitive bidding, and sound construction practices under competent inspection, has permitted Virginia to forge steadily ahead toward the goal of a highway system "second-to-none".

The basic objective in pavement design is to build a structure that will transmit the superimposed loads to the underlying strata without permanent distortion and with a minimum of deflection. In order to attain this concept it is necessary to have a full knowledge of the engineering properties of each component material of the structure, as well as of the foundation upon which it will rest.

Preliminary surveys made either on the ground, by aerial photography, or combination of both, permit the plotting of a continuous roll grade line for use by the soil survey parties. A detailed soil survey is made for every project by an experienced soils engineer, taking as many soil samples for laboratory analysis as is deemed necessary.

Nearly all of these surveys are accomplished with the aid of mobile power drilling equipment. The soil augers penetrate the in-place soil always to a minimum of five feet below the grade line or to solid rock. As might be expected, this sub-surface investigation is fraught with many pitfalls. It is quite difficult to accurately predict grade line conditions through cuts from the evidence gathered at test holes drilled with a 6-in. or 8-in. auger at every 200 ft. In Tidewater Virginia, with sand and gravel predominating, boulders and muck deposits oftimes show up, in unexpected quantities and in locations which causes modifications in working plans and contracts during construction. Similarly, boulders are often encountered in the Piedmont area. And in the mountainous limestone areas we find caves, solution channels, ledges, and boulders, all of which contribute to the probable development of misinformation on a soil survey.

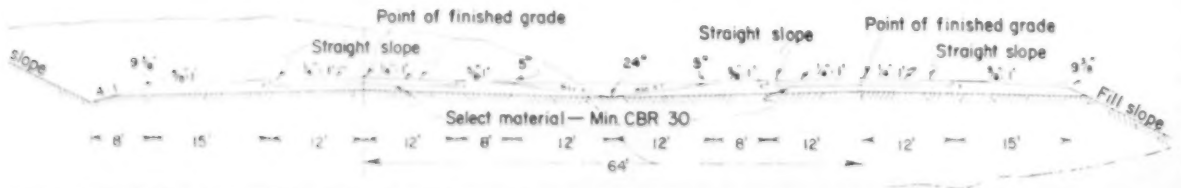
A staff of geologists utilizing electrical resistivity equipment supplements the soil surveys in rock country. The calibration of their equipment with outcrops of the rock in the area through which they are working, plus a geologist's knowledge of the rock formations, quite adequately supplements the data obtained from the soil survey. The two together permit the contractors to place a great deal of confidence in the soil profile and generally reflects favorably in bid prices.

Soil surveys are made in accordance with AASHO Designation: T 86-54, Surveying and Sampling Soils for Highway Purposes.

● During the field soil survey, careful attention is paid to ground water conditions. Evidence of saturated soils is noted, and in the final design recommendations, provision is made to either waste the material off the project, to place it in the bottom of fills, or to require drying if the material is suitable and needed to better balance quantities. In wet areas (not necessarily saturated), where subdrains can be expected to satisfactorily handle the water, this condition is also noted and proper design recommendations made. Careful attention is also paid to fill sections to locate possible soft or swampy conditions. Frequently where muck conditions are encountered, undisturbed samples are taken and consolidation tests made in the laboratory. Recommendations for construction procedures are then possible.

With the comprehensive field soil survey completed the engineering properties of the representative samples of soils found within the confines of the project are determined in the laboratory. The normal tests are made in accordance with procedures outlined in the AASHO Designation: M 145-49, The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes. Soils are given the proper classification based on the sieve analysis, liquid limit, and plastic limit. The maximum density, optimum moisture content, shrinkage limit and shrinkage ratio are also determined by appropriate AASHO Methods of Tests.

Typical Design – An Interstate Project



● Consists of 26' x 6" crushed aggregate subbase, 24' x 7½" bituminous concrete base; bituminous concrete surface course, using 170 lb. per sq. yd. of type H-2 and 30 lb. per sq. yd. of type F-4.

The above tests give a good picture of the engineering properties of the soils being studied, but still do not provide positive values for their bearing capacity. This determination of bearing capacity is the crux of satisfactory pavement design and several different procedures for determining this value are followed by the various highway departments throughout the United States.

● The Virginia Department of Highways has selected the California Bearing Ratio Method, commonly known as the CBR Method, with some modification, as most suitable for traffic conditions in this area. Actually, the family of CBR curves is used with the designated wheel loads to determine the total depth of pavement required. The only modification in the test procedure is in the compactive effort applied in the preparation of the test molds. The construction specifications require fills and subgrades to be compacted to 95 percent of standard Proctor density as determined by AASHO Designation: T 99-57, The Moisture-Density Relations of Soils Using a 5.5-lb. Rammer and a 12-in. Drop. This value is also used for the CBR test.

With the above laboratory information in hand, the pavement design can be developed. Because the CBR value of the in-place soil is not constant throughout any project, and because of adverse ground conditions found during the soil survey, a variable thickness of selected subgrade material is necessary. Above this will be subbase, base and surface courses, and these will be of uniform thickness throughout the project. Depending on the particular road being built, whether the primary, secondary, or interstate system is involved, and upon anticipated or actual traffic, the select material will be specified to have a minimum CBR value. In the case of the Interstate System, the minimum CBR is specified as 30.

As flexible pavement performance is profoundly affected by traffic density, especial attention is paid to this factor. Traffic information is obtained from our Division of Traffic and Planning. This includes the total number of vehicles, classified according to size and weight. Because of the continual bending and deflecting, causing fatigue of the pavement, it has been found expedient to classify the roads according to the number of trucks and buses, and to assign an empirical factor to be utilized in the pavement design. At present this classification for design on the primary and Interstate System is set up as shown in Table I.

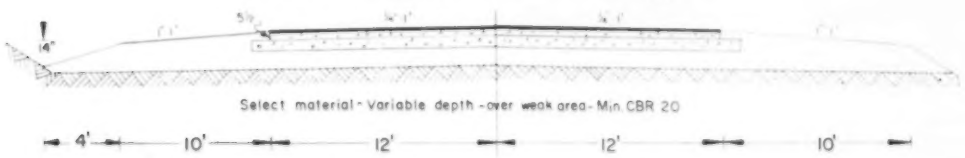
Table I—Commercial Vehicle Factor

Estimated Daily Traffic, Trailer Trucks & Buses	Traffic Category	Factor
0-19	I	0.75
20-199	II	1.00
200-699	III	1.25
700-1499	IV	1.50
1500-2499	V	1.75
2500 and over	VI	2.00

In practice the wheel load used with the CBR design curves is based on the estimated volume of traffic. The empirical factor is utilized by multiplying the design wheel load of 12,000 lb. by the factor to take into full account the frequency and character of the traffic loads. For example, a highway with an estimated volume of 700 to 1499 trucks and buses would fall in Category IV, and a value of 12,000 × 1.50 or 18,000 lb. would be the curve followed on the CBR chart. With the known CBR value of the in-place soil from the laboratory tests, the total depth of subbase, base, and surface to carry the anticipated traffic can be read directly from the chart. An additional factor of 20 percent for impact loads is included for the wheel load being studied.

With the total required thickness thus found,

A Primary Road Design



● Consists of 26' x 6" subbase, 24' x 5½" bituminous concrete base course, and 165 lb. sq. yd. of bituminous concrete surface.

A Secondary Road Design

● For Class II (200-400 vehicles per day; wheel load 6,000 lb.—20' x 8" soil-cement base course; .2 to .4 gal. per sq. yd. prime (RC-2); .2 to .35 gal. per sq. yd. double-seal with RC-2 and 22 to 28 lb. per sq. yd. cover aggregate.

the design engineer must decide the actual depths for each component part of subbase, base, and surface to be recommended. This decision of course, is based on the work and observations of water conditions in the field during the soil survey, the laboratory analyses of the soil samples, and the anticipated traffic volume. It is at this point that past experience and economies of various combinations of materials and depths become of major importance in the design.

● *Secondary Pavement Design.* In general, the same design program is followed for the Secondary System of roads. Traffic volume and loads are much lower and the resultant pavement designs are of lesser depth and strength. Select materials of low (10) CBR value are utilized in these pavements and often the final surfacing is delayed for approximately one year to permit additional consolidation to take place and any potentially weak areas to develop and be corrected.

Tentative pavement design standards have been established for the secondary roads based on four traffic categories. In the first category, Class I (lowest traffic volume), five alternate designs are set up. In Class II there are three alternate designs; in Class III, eight; and in Class IV (heaviest traffic volume), nine alternate designs are established which are considered to meet traffic demands.

A problem frequently encountered is the lack of suitable select material required on the project available within a reasonable and economical hauling distance. In these cases, it is generally feasible to modify and improve the bearing value of the soil in the subgrade by means of admixtures. The use of portland cement has found considerable favor and its use is gradually being extended to the higher-type pavements. Both cement-treated subbases (minimum 4 to 6 percent of cement by volume) and normal soil cement subbases (10 to 14 percent by volume) are being utilized.

Other additives such as lime and lime-fly ash are being used to a very limited extent for subgrade treatment. Current research indicates benefits in both plasticity and bearing values can be expected. In comparison with soil cement stabilization, the rate of development of strength or bearing value is considerably slower, but generally as definite. The regular subbase, base and surface is then constructed on the modified subgrade in accordance with existing construction practices.

The select material used in these pavement designs is specified to have a maximum aggregate size of 3 in., and be well graded from coarse to fine, with not more than 25 percent passing the No. 200 mesh sieve. The Liquid Limit shall not be greater than 30, and plasticity index not greater than 9. The minimum CBR value shall be as specified.

The subbase material for the Secondary System, if specified, is generally the select material described above. For the Interstate and Primary Systems, soil aggregate and crushed aggregate very closely corresponding with the requirements of AASHO Designation: M 147-57, Materials for Soil-Aggregate Subbase, Base and Surface Courses, is specified. Here again, availability of materials dictates the choice of the design engineer.

Base courses for the Secondary System are variable. They range from subbase materials described above to penetration macadam, to 3 in. of bituminous concrete black base, and to combinations of base materials on heavily travelled roads.

The base course for the Primary System is either 5½ in. or 7½ in. of bituminous concrete black base. On the more lightly travelled roads only 3 in. of black base may be specified.

Standard design for base on the Interstate System is 7½ in. of bituminous concrete black base. This black base is Type H-3 (1) Bituminous Concrete in the current Road and Bridge Specifications.

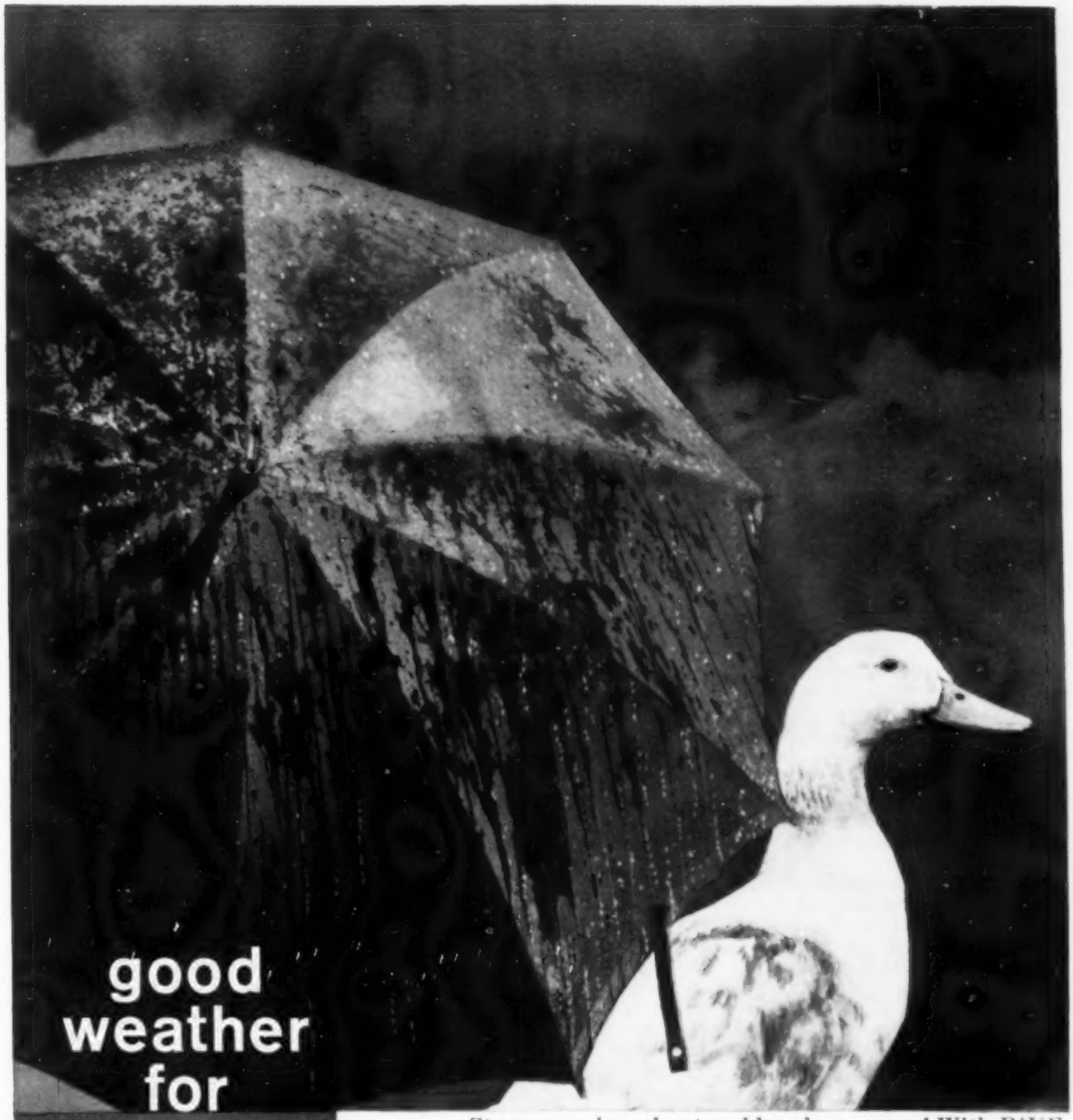
Surface courses or wearing courses of all types are utilized. They range from single surface treatments to mixed-in-place, and light penetration treatments on the Secondary System, to asphaltic concrete surfaces on the Primary and Interstate Systems. In areas of Virginia where easily polished aggregates are predominant, certain restrictions have been placed on their use in surface courses, because of their tendency to become slippery under traffic. On some of these projects it has been the practice to specify a 1½ in. binder course, Type H-2, over the black base and then apply approximately 30 pounds per square yard of a deslicking mix for the wearing course. On other projects a coarser sand asphalt mix, Type F-1, than the deslicking mix is specified and applied at the rate of 60 pounds per square yard.

TABLE II
Specifications for Bituminous Mixes

	Total Percent Passing			
Sieve	H-3(1)	H-2	F-1 Sand Asphalt	F-4* Deslicking
2"	100			
1½"	90-100			
1"		100		
¾"	65-85	95-100		
⅜"		60-80	100	
No. 4	30-45	40-60	75-90	100
No. 10	20-35	20-40	60-80	95-100
No. 40			15-35	40-95
No. 80		3-10	5-15	12-30
No. 200	0-5		2-10	0-8
Bitumen (85-100 Pen)	4.0-7.0	4.5-8.0	5.5-9.5	7.5-9.5

*In addition to the grading requirements, the addition of either 3 percent of hydrated lime or a heat-stable additive in the amount specified by the Engineer, is specified. The mix combination of sand, bitumen, and additive must stand a ten minute immersion test in boiling water without apparent harm before approval for use is given.

While performance of flexible pavements is basically dependent on design other factors must be considered. Climatic conditions, particularly rainfall and frost penetration affect performance to a great extent, but most important is the need to follow good, sound, and proven construction practices throughout the project. Black base flexible pavements are now giving excellent performance in Virginia, and the present design policy is anticipated to serve traffic needs for a long time ahead.



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Views and Comments

. . . By H. G. Nevitt

WHAT NUMBER OF BINS?

The possibility of needing fewer coarse aggregate bins and more fines bins, is raised among other considerations in this discussion of the problem of control of bins.

There is a steady continuing tendency towards the use of plant hot mixes; likewise toward precision of design and control, as well as the trend toward the so-called higher type mixes, with closer specifications on the aggregate graduation. At the same time experience, particularly where careful inspection and frequent testing of mixes are involved, has shown the need for greater care in some phases of the plant operation with consequent demand for equipment changes or additions. The overall result could be a highly elaborate, hence expensive, plant from the standpoint of investment and use. Some scrutiny of the fundamentals of plant control of the aggregate fractions may therefore be provocative, and perhaps rewarding.

In this discussion we have in mind especially the portable type plant which must be moved from project to project. The points made likewise apply to the stationary and essentially permanent plants now so common in large population areas; but such plants can better afford (in that they can more easily and surely pay out) the more elaborate facilities which appear in the offing.

● Filler is a supplementary ingredient: where there is sufficient filler in the mix the considerations discussed following become even more important. Filler is beginning to receive a great deal of attention. We discussed this item last year: last January at the Denver A.A.P.T. meeting Warden pointed out the considerable variation in filler characteristics and suggested a means for gauging filler quality. In the typical mix referred to later the filler, while contributing only 6 percent of the weight supplies something like 39 percent of the surface area and takes 26 percent of the binder; small fluctuations in filler content cause too large a change in the film (and mix) characteristics to justify lack of attention to it. Usually a separate filler source and proper filler content are essentials.

The finer fractions in the cold aggregate feed—that is, the portion below something like the 80 or 100 mesh screen size—have proven in practice to be a source of considerable operating difficulty, accompanied by undesirable mix component fluctuations. The usual procedure today is to collect and return to the hot elevator such fine fractions as are picked up by the air going through the drier. Dust collectors to recover these fractions are practically mandatory on modern plants, partly to eliminate the dust nuisance, partly because the material recovered is valuable. Unfortunately the cycle of flow of these fines to the elevator is not identical with that of the rest of the aggregate, so that fluctuations result from starting up and shutting down; likewise, when these fractions get in the fine (or No. 1) bin they tend to hang up and then flow down in extra quantity at times.

Both these situations may cause serious variations in the mix which even close control and inspection will not prevent. The only sure remedy is a separate bin for this component of the mix and a separate feed to the pugmill. And probably the design of the plant should be modified somewhat if this procedure is adopted, so that the No. 1 bin will contain relatively little of these trouble-making fractions.

● A separate bin for the portion of the sand range fraction not so picked up (but below something like the No. 4 screen size) is obviously needed; it will still constitute a considerable proportion of the mix by weight, and a much larger proportion of the surface area to be covered and the asphalt required. Therefore, for reasons primarily of control and uniform operation we are faced in the usual plant with three finer materials desirably handled and controlled separately. If the specifications call for anything like a high type mix, there will in addition be from one to three bins for the coarser aggregate. The question is to determine how many coarse aggregate bins there should be, and what are the benefits as the number is increased from the one obviously needed as a minimum.

As previously noted, this is not likely to be a problem with permanently located plants—particularly when the plants are providing cus-

Table 1—How Fractions Influence Mix Variables

Aggregate Fraction		Percentage of Mix Accounted For By Fraction on Basis of		
Max. Screen	Min. Screen	Weight	Surface Area	Asphalt Content
¾″	½″	5	0.1	0.7
½″	⅜″	10	0.4	1.3
⅜″	4	20	1.2	4.0
4	8	10	1.3	3.0
8	20	17	4.9	9.1
20	200	32	53.1	56.2
200	—	6	39.0	25.7
Totals		100	100.0	100.0

tom mixes of different size maximum aggregate. Our discussion will assume that (for any particular project) the maximum size does not vary, and that the purpose of the additional bins is to better control the variation in the fractions between the top size and that set by the No. 1 bin maximum size.

● Not too much data has appeared on this point. Much has been done on the balance between the coarse and fine fractions, but little on variation occurring only in the coarse range. This data indicates some effect from such changes, though not as much as might be expected; however, those studies we are familiar with do not include the further step which the experienced designer usually would take, of adjusting the proportions of the coarse and fine components to suit the changes in the intermediate portions of the coarse fractions. Of course such an adjustment cannot be done on an hour-to-hour basis; it would be practical only when slow but consistent changes occurred in the raw material supply from pit or quarry.

In our view this latter variation is the more likely, and in such case one, perhaps two, but rarely three bins would be indicated. On the other hand if the nature of the sources, the volume of the output or other factors made large variations in the gradation of the coarse fraction probable despite a reasonably fixed maximum and minimum size, certainly two bins would be required, and three might be reasonable.

The decision can be more rationally arrived at if some basic facts about the contribution of the various fractions to the influencing variables of the mix is considered. The accompanying table summarizes these data for a typical mix (that described in Hudson's paper at the N.B.C.A. Las Vegas meeting).

It is evident that the contribution of the entire fraction above the No. 1 bin to the elements usually most influential in the structural action of the mix—namely, the surface area and the asphalt thereon—is not large; and when the individual contributions of the fractions generally present in separate bins in the typical modern high type mix plant are considered, they are indeed small. This seems to confirm our doubts as to the need for any great number of coarse aggregate bins in the usual portable plant. It

likewise emphasizes the desirability of a separation between the "sand" fraction and the fines now usually going into the No. 1 bin.

We recognize that this subject cannot be settled by offhand discussion. There is always the possibility that in some mixes the coarse aggregate gradation, rather than the proportion of the material above the No. 1 bin fraction, will prove to be a sensitive factor in the mix, or some other special situation will call for several coarse aggregate bins. Our point is primarily that, as the situation now appears, the burden of proof seems to be on those demanding a considerable separation in the entire coarse aggregate fraction. We believe that the matter should be given study; that the practical facts, with perhaps some laboratory studies where indicated, should be accumulated; and the whole matter reduced to one of known considerations on which a realistic and sensible decision can be based.

The production of asphalt mixes from the available raw materials is essentially a manufacturing operation. Like all such it is susceptible to continual improvement, usually involving additional refinements on one hand and simplifications on the other, as "know-how" accumulates from better understanding and experience with the various factors involved. As the sensational progress of America in this respect indicates, better product quality and lower (relative) cost are usually associated with this development. It is not unreasonable to expect that careful engineering scrutiny of the mixing operation may lead to similar results.

At ASTM Meeting

Many Papers on Bituminous Paving Problems

Testing and design of mixtures, bituminous binder test aspects, viscosity and density of asphalt, among subjects covered at Atlantic City Meeting.

A Symposium on Methods of Testing for Design of Bituminous Paving Mixtures, sponsored by ASTM Committee D-4 on Road and Paving Materials, was held during ASTM's 62nd annual meeting at Atlantic City.

The papers covered several test methods which have been developed, and related them to their usefulness in the actual design of bituminous paving mixtures. A paper on "General Factors in the Design of Bituminous Paving Mixtures," presented by Prof. L. F. Rader, University of Wisconsin, reviewed briefly the significant properties required of bituminous paving mixtures: stability, density, durability, flexibility, resistance to skidding and workability during construction. He cited the importance of optimum bitumen content and also reminded that economy must always be taken into account.

J. L. McRae and C. R. Foster, U. S. Army Waterways Experiment Station, collaborated in paper on "Theory and Application of a Gyratory Testing Machine for Hot-Mix Bituminous Pavement." The testing machine described is of the kneading type developed by the Texas state highway department for laboratory compaction, but further expanded to permit mechanical compaction of specimens to any given field condition. The authors believe that this equipment can be used to evaluate the plastic properties of specimens directly during the compaction process and thus indicate the optimum asphalt content.

The Marshall test method has received increased use in the design of hot-mix bituminous pavements. This has led to a study of the reproducibility of test results using this apparatus in a number of locations. H. L. Lehmann and V. Adam, Louisiana department of highways, discussed in their paper an investigation involving different operators; hand mixing and mechanical mixing; heating of the breaking heads to 140° F; and the effect of viscosity of the asphalt. Keeping these variables in mind, the authors have concluded that the Marshall apparatus being simple, portable and inexpensive, is a valuable tool in Hot-Mix design and control.

● A paper entitled, "Control of Bituminous Shoulder Construction for the Northern Illinois Toll Highway," by J. J. Waddell, of Knoerle, Graef, Bender and Associates, Inc., Chicago, reviewed experiences in using the Marshall test method to design the asphaltic concrete. The special specification requirements established were described. The author covered the inspection routine and the control. Adequate training of inspectors was stressed. Control should start at the refinery and quarry.

● The use of the Triaxial Shear Strength Method of Test has been known and used for the past twenty-five years. W. H. Goetz and J. H. Schaub, Purdue University, summarized the status of Triaxial testing both as a design and a research tool, and presented a resume of

ASTM Papers On Viscosity and Density

Viscosity is of primary importance to product quality control in asphalt manufacture, and therefore it is necessary to establish dependable limits of consistency and workability of both manufacture and use. The use of capillary viscometers and fundamental viscosity units as a substitute for a Saybolt Furol Viscometer was described in a paper jointly authored by D. V. Levy, F. E. Fassnacht, G. P. Hibler, R. D. Umbach, and D. C. Cagle, Phillips Petroleum Company, and presented by Mr. Levy. Mr. Levy reviewed the nearly three years' experience in three plants in the use of a capillary crossarm viscometer for Kinematic viscosity.

● On the basis of this study, it is recommended that present cut-back asphalt specifications be expanded to include alternative Kinematic viscosity values at 140° F in addition to Saybolt Furol values. The advantage of the Kinematic method appears to be in connection with volatile or rapid-cure cut-back asphalts.

This paper elicited considerable discussion with three written discussions presented. A discussion by W. T. Halstead, Bureau of Public Roads, confirmed the reliability and applicability of the test procedure and conversion factors. A second discussion by L. F. Erickson, Idaho department of highways, supported the use of a single temperature of 140° F for all grades of liquid asphalts, and possibly asphalt cements. The use of the Shell slide plate micro-viscometer in conjunction with the Zeitfuchs tubes was recommended in order to give the paving engineer a better understanding of the material with which he is working. A third discussion by John H. Barton, Missouri state highway department, also gave credit to the use of the Zeitfuchs viscometer tubes at a single temperature of 140 F for all grades of bituminous materials. The speed in running this test was stressed.

● A loss in density with time was observed on a large number of cores taken from experimental pavement sections made in accordance with a Corps of Engineers' design of asphalt concrete. This led to a study of these changes as reviewed in the paper by T. C. Hein and R. J. Schmidt, California Research Corporation. Data indicated a drop in relative density approaching 2 percent in eight days. Interesting features reported by the authors included the fact that changes in density may be in contrary directions as time goes by, depending on the aggregate type and mix gradation. This has resulted in unnecessary re-rolling of the pavement as well as in the acceptance of inferior pavements. The authors reported a need for evaluation of relative density requirements. As an interim guide, a maximum time limit for testing of four hours after coring will preclude gross differences in results.

the various triaxial testing procedures that are in use. One of the major problems in using the triaxial test for the evaluation of bituminous mixtures, is that the method is so flexible that there is no acceptable standard of procedure. Common nomenclature is even lacking.

Further research would establish a more uniform basis for the use of this method in the design of bituminous mixtures, according to V. R. Weathers, State Highway Commission of Kansas. Experience has led to the use of triaxial equipment to evaluate the modulus of deformation for determining the thickness of flexible pavement required, rather than for the design of bituminous mixtures themselves.

● "Correlation of Hveem Stabilometer and Cohesiometer Test Results and Kneading Compactors Densities with Service Records of Bituminous Pavements," was the title presented by C. E. Minor, Washington state highway commission. Density is an important property in the pavement mixtures, and it was found that the Hveem Stabilometer and Cohesiometer were very useful tools for designing bituminous mixtures. A. W. Eatman, Texas highway department, in a prepared discussion described the use of the Hveem Stabilometer for

triaxial tests and presented some of the history of its use for design, control, and evaluation of bituminous mixtures.

Void requirements for determinating graded bituminous paving mixtures was the subject of a paper presented by M. W. McLeod, Ottawa department of transport. Pavement durability requires careful consideration of the void properties. The determination and evaluation for air voids, and for volume of void space between aggregate particles, was discussed carefully by the author. The advantages and disadvantages of calculating these values was stressed.

The use of the immersion-compression test was described by J. F. Goode, U. S. Bureau of Public Roads, in a paper entitled "The Use of the Immersion-Compression Test in Evaluating and Designing Bituminous Paving Mixtures." Stability was measured by the compressive strength portion of the immersion-compression test. Flexibility was taken into account by setting the asphaltic content at its maximum practical value and by limiting the maximum amount of dust. The use of the Rice vacuum saturation method of determining maximum specific gravity of the mixture and effective specific gravity of the aggregate for use in constructing air voids was described.

● *Statistical Approach to Binder Tests.* At the ASTM meeting Committee D-4 on Road and Paving Materials revealed that it is conscious of the increasing role of statistics in the testing and research of bituminous materials. A Symposium, discussing precision and evaluation as well as practical significance of tests, sponsored by Committee D-4 was presented during the convention.

The opening paper was an historical resume of the evolution of ASTM tests and specifications for asphaltic materials, prepared by Gene Abson, Chicago Testing Laboratory.

A very comprehensive paper on the practical significance of tests on asphalt cements was presented by N. W. McLeod, Imperial Oil, Ltd. Mr. McLeod gave the point of view of the highway or airfield engineer rather than the rheologist or chemist. Six basic engineering requirements noted were: consistency, resistance to hardening or other physical and chemical changes, good affinity or adhesion for the aggregate, solubility in such solvents as carbon disulphide or carbon tetrachloride, safety in handling at high temperatures, and uniformity in its characteristics.

This author also reviewed the commonly used physical tests which are generally referred to in specifications. It is his conclusion that specifications for asphalt cements should be restricted to those items that can be related to asphalt performance.

Precision of present ASTM tests on bituminous paving binders was the subject of a paper by A. B. Brown, Standard Oil Company (Indiana). The adequacy of the precision of the several ASTM test methods has been examined by Mr. Brown and found, in many cases, to be inadequate in clarity and coverage. The author found that, of 31 standards involving 56 different tests, which should require precision statements, 19 had neither repeatability or reproducibility clauses. In standards involving no bituminous components, of 21 requiring precision statements, 18 had neither repeatability nor reproducibility clauses. A review was presented of the various forms of precision statements currently in use in ASTM standards. Mr. Brown presented several recommendations regarding precision statements.

The need for statistical procedures to have essentially the same meaning for all who are involved in their use, was stressed by P. E. Irreck, Highway Research Board in his paper entitled, "Fundamental Statistical Concepts in Testing."

Chairman D. F. Fink, Shell Oil Company, closed the symposium by reiterating the objective. This was to define the general problem of establishing a satisfactory level of

(Continued on page 195)

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B-E 37-B, 1½ yd. Good	2,500.00
Buckeye 70 and GarWood 20A. New	850.00
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Koehring 701, 2-yd. New	3,500.00
Lima 604, 1½ yd. Good	3,000.00
Lima 34, ¾ yd. New	1,250.00
Lorain 820, 2½ yd. Complete	5,500.00
Lorain 40, ¾ yd. Complete. New	1,250.00
Link-Belt LS-75. Good	750.00
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1955 IHC CO 195 Roadranger, completely reconditioned, ready to work, priced right.
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1—TD18 with hyd. dozer. $2975.
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Model PT 1807, 2,500,000 BTU, Includes electric motor and auxiliary circulating pump.

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One mounted on Ford Truck

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Machines and pipes completely reconditioned.
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(2) Westinghouse 400 H.P. VERTICAL MOTORS (ditto above).

Complete with all valves, gauges, electrical controls, piping, etc. Attractively priced prior to dismantling. Inspection invited at job site. We will dismantle and ship.

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Cable and Controls
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2—Bucyrus-Erie Tractor Drawn Scrapers, Model B-250 22-27½ c.y., S/N 77767 and 77768, Rubber Excellent, ea.	$8,600.00
1—Parsons Model 221-2A Trench Machine, Maximum Depth 11 ft., 16" to 32", width S/N 2093	4,500.00
1—Koehring Longitudinal Finish Mach. 12-28 ft. S/N LF1433	4,500.00
1—Koehring Longitudinal Finish Mach. 8-12 ft. S/N LF1127	2,500.00
1—Koehring Longitudinal Finish Mach. 8-12 ft. S/N LF1302	2,800.00
3,360 l.f. 9x9 Heltzel Road Forms, per L.F.	65c
8,000 l.f. 9x9 Heltzel Road Forms, per L.F.	95c
1—TD-6 International Hi-Lift, ¾ c.y. S/N TDBK28976	2,500.00
1—Koehring 16E Rubber-Tired Paver S/N 27505, like new	16,500.00
2—Model 5 Buckeye Chip Spreaders, 10 ft., ea.	780.00
2—Fox Strawblowers, ea.	650.00
1—Bros Preparator Model BP-180, Ser #118	9,400.00

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DEPENDABLE USED MACHINES
FOR SALE: 2 caterpillar D-7 tractors arranged w/cable control, bulldozer blade Model 7S, 22" Grouser tracks; gasoline engine starter w/elec. start on gas. eng. Equipped w/hyster ½ yd. backhoe. New in Oct., 1957. Located in New York state. Will sacrifice for $22,000. FOB location.
TRACTOR & EQUIPMENT CO.
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FOR SALE
B-E 15-B Shovel Front

New, unused, complete with all necessary cables, lagging, chains, etc. Price F.O.B. Harrisburg, Illinois.

$750.00

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Will sell part interest or controlling interest in a modern stone quarry in North Central Indiana to the right party that will invest capital for expansion to meet sales demands. Box # 1225, Roads and Streets, 22 W. Maple St., Chicago 10, Ill.

Contractor's Bid Withdrawal Refused in Arkansas

A Texas contracting firm which made a serious error in bidding and asked to withdraw its bid, has been refused by the Arkansas state highway department.

The firm is Ottinger Construction Company at Fort Worth, Texas. This company discovered a bookkeeping mistake of $280,000 had been made in figuring an Arkansas state highway job. The president, E. C. Ottinger, requested that his firm be relieved from his bid. The department nevertheless made formal acceptance, whereupon Ottinger brought suit in Federal District Court to enjoin the department from making the award.

The court dismissed Ottinger's complaint and upon his failure and refusal to execute the contract or supply his performance bond, suit was brought by the state highway department against Ottinger and his bid bond to recover $35,000, the amount of the bond.

This suit is still pending in Pulaski Circuit Court, according to R. B. Winfrey, acting director of the Arkansas department.

Manufacturers' Literature

EARTH-MOVING EQUIPMENT in Soil and Water Conservation, Allis-Chalmers, Milwaukee 1, Wis., has published two pieces of literature spelling out new opportunities in conservation for both the farmer and the earthmoving contractor.

One is "New Opportunity in Soil and Water Conservation for Farmers and Contractors" (TL-2044). It explains land treatment practices to increase farm income and save soil and water.

The other is the March-April, 1959, issue of the Allis-Chalmers "Reporter," external house organ of the Tractor Group's Construction Machinery Division. This discusses soil and water conservation and its significance, particularly to earthmoving contractors.

For more details circle 177 on Enclosed Return Postal Card.

A NEW TRADEMARK: Here is Hyster Company's striking new trademark design which replaces the venerable Atlas symbol, used for 30 years.

For more details circle 178 on Enclosed Return Postal Card.

THE FLEXIBLE ROAD JOINT MACHINE Co., Warren, Ohio, has issued bulletins on its equipment: Bulletin 59-11, utility bridges for concrete paving; Bulletin 59-16, subgrade testers; Bulletin 59-15, subgrade planers; Bulletin 59-9 D.C., gas-electric concrete finisher; Bulletin 59-17 automatic spray curing equipment; Bulletin 59-6 D. C., gas-electric bridge deck finisher; Bulletin 59-5, gas-electric finisher-float machine.

For more details circle 179 on Enclosed Return Postal Card.

CRAWLER TRACTOR: A 16-page catalog MS-1243, available from Construction Machinery Division, Allis-Chalmers Manufacturing Co., Milwaukee, Wis., covers the new HD-21 crawler tractor, powered by the recently introduced 225-hp turbo-charged disel 21,-000 engine. Highlights of the engine, its combustion system, and other features are illustrated and described. Specifications are included.

For more details circle 180 on Enclosed Return Postal Card.

LAND CLEARING PROBLEMS AND THEIR TREATMENT by Fleco specialized equipment for Caterpillar track-type tractors are presented in a well-illustrated 4-page brochure just released by Fleco Corporation, P.O. Box 2370, Jacksonville, Fla. Included is material on the new Fleco "Multi Application" Rakes and on the new "Traxcavator" Rake.

For more details circle 181 on Enclosed Return Postal Card.

"CRACKS IN CONCRETE," a new 8-page folder, designed to help concrete producers explain and control cracking, has been issued by Alpha Portland Cement Co., Easton, Pa. Sketches and magnified sections are given with the text. This bulletin is the fourth in a series of "Craftmanship in Concrete" service bulletins prepared by Alpha. Other folders in the series are "Steel Trowel Finishing," "Cold Weather Concreting," and "Hot Weather Concreting."

For more details circle 182 on Enclosed Return Postal Card.

ROTARY GUN DRILLS: Standard-Keystone Co., 1210 Kenton St., Springfield, Ohio, has released a new 8-page bulletin describing a complete line of rotary gun drilling machines. Bulletin presents general specifications and descriptions including capacities, engines, air compressors, pumps, derricks, levelling jacks and flood lights. Rotary drilling equipment tools: inset rock bits, portable mud pits, tool substitutes, stabilizers and drill pipe are also presented.

For more details circle 183 on Enclosed Return Postal Card.

TRUCKS: Three new catalogs describing medium, heavy duty, and six-wheel trucks are available from International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. Catalog E-100-I illustrates features of medium and heavy-duty, cab-forward trucks. Catalog E-128-I shows BCF-170 and 180, sixwheel and six-wheel-drive trucks. Catalog E-49-I covers heavy-duty, cab-forward trucks in conventional and six-wheel series.

For more details circle 184 on Enclosed Return Postal Card.

HOT WEATHER CONCRETING: Master Builders Co., Cleveland 3, Ohio, has issued Bulletin RM-67b giving nine vital steps in placing quality concrete in the most extreme hot weather. Recommendations cover "before, during and after" placing operations, and explain preparation of forms; erection of shades; ordering and scheduling ready-mix concrete; protection of concrete during finishing; curing and care of test cylinders.

For more details circle 185 on Enclosed Return Postal Card.

THE WIRE ROPE DIVISION of Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa., has issued five separate, 4-page pamphlets, describing seven of its products: Centerfit Wire Rope; Cable Laid Slings; PlastiKore and SpringKore Wire Rope; JalKlamp and JalLoc Slings and Oil Field Manila Rope.

Each pamphlet describes the various applications for which the product is best suited. Specifications for strength and size are listed in tables, and a brief guide on how to order wire rope is presented.

For more details circle 186 on Enclosed Return Postal Card.

STEAM-JET CLEANER: A new bulletin SC-500, issued by Steam Generator Division, Pantex Manufacturing Co., P. O. Box 660, Pawtucket, R. I., describes the recently introduced 100-gph "Speedysteam" portable Steam-Jet Cleaner. Details on design and operating advantages are given.

For more details circle 187 on Enclosed Return Postal Card.

"MEASURING TAPES, RULES, AND TAPE RULES," Catalog No. 104 of The Lufkin Rule Co., Saginaw, Mich., is now available—164 pages fully illustrated and completely indexed.

For more details circle 188 on Enclosed Return Postal Card.

BATCHING PLANTS: A new bulletin, No. 59210, available from Chain Belt, Sales Promotion Department, Milwaukee 1, Wis., carries complete information on Rex "Porto-Plant" Models 60 and 125 and their components, including: portable aggregate bins, portable cement storage bins, batching equipment, portable belt conveyors, screw conveyors, and control systems.

For more details circle 189 on Enclosed Return Postal Card.

DUMP TRAILER BODIES: A new booklet, entitled "Let's Talk Trailers" produced by Galion Allsteel Body Co., Galion, Ohio, contains helpful information on dump trailer bodies and hoists designed to aid users in choosing the correct equipment for specific on-and-off-the-highway and dumping applications.

For more details circle 190 on Enclosed Return Postal Card.

ELECTRIC PUMPS: Stenberg Manufacturing Corporation, Hoosick Falls, N. Y., has issued a folder describing in detail its heavy-duty, submersible electric pump, the "Flygt" B-80L, which has a capacity of 300 gpm against a head of 25 ft. or 70 gpm at 150 ft.

For more details circle 191 on Enclosed Return Postal Card.

WEED KILLER: A new folder, available from Allied Chemical's General Chemical Division, 40 Rector St., New York 6, N. Y., describes "Urox" weed killer. A new granular herbicide which is sprinkled or spread on soil to kill all weed growth in non-crop areas.

For more details circle 192 on Enclosed Return Postal Card.

AIR STARTING MOTORS: A new 24-page bulletin, Form 5094-E, has been issued by Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y., on cranking internal combustion engines with air power. It contains case histories on air starting motor installations, gives information on how to select the proper air starting motor, and lists advantages of these units.

For more details circle 193 on Enclosed Return Postal Card.

TRUCK CRANE: A new 12-page bulletin, No. T-350, issued by Shield Bantam Co., Waverly, Ia., covers its 11-ton carrier-mounted crane-excavator. Bulletin describes and illustrates the Model T-350, including the complete line of Bantam-built crane carriers available for mounting, and the complete line of Bantam-built front-end attachments.

For more details circle 194 on Enclosed Return Postal Card.

DUMP TRUCK AND TRAILER BODIES: A new 42-page catalog has been published by Galion Allsteel Body Co., Galion, Ohio, on its line of hydraulic hoists, steel and aluminum dump bodies, and dump trailers. Among the latest model contractor and excavator bodies shown are pickup dumps, steel platforms, special units, and extra-heavy coal and rock bodies in a variety of sizes and types.

For more details circle 195 on Enclosed Return Postal Card.

FINISHERS: Two new bulletins on its finishers are available from Chain Belt Co., Sales Promotion Dept., Milwaukee 1, Wis. Bulletin 59151 covers "Rex" transverse finishers and Bulletin 59156 covers "Rex" longitudinal float finishers.

For more details circle 196 on Enclosed Return Postal Card.

TRACTOR AND TRACTOR PARTS: A new 20-page booklet has been issued by The Eimco Corporation, P. O. Box 300, Salt Lake City 10, Utah, illustrating and describing its Series 105 tractor and tractor units. Covered in the booklet are the tractor and dozer, excavator or excavator-dozer combination, and front-end loader and fork lift.

For more details circle 197 on Enclosed Return Postal Card.

POWER BUGGY: A new 2-page bulletin BG-1, issued by Aeroil Products Co., Inc., 69 Wesley St., South Hackensack, N. J., describes Model BG-10 power buggy, which has a capacity of 10 cu. ft. and will carry 1,000 lb. up a 20% slope.

For more details circle 198 on Enclosed Return Postal Card.

"DEFEATING DIRT" is the title of four new bulletins published by Cummins Engine Co., Columbus, Ind. They give details on how to care for diesel engines to obtain maximum performance, economy and engine life. Special tips are given on how to maintain engines to reduce down time and repair costs.

For more details circle 199 on Enclosed Return Postal Card.

FILM ON RUNWAY CLEANING: The Wayne Manufacturing Co., 1293 East Lexington, Pomona, Calif., has released a motion picture descriptive of the damage to jet airplane engines through the ingestion of foreign material, including sand, gravel, nuts, bolts, washers, and similar debris found on airport facilities; and presenting a solution to the problem through use of the Wayne Air-Jet Runway Vacuum Sweeper. 16 MM, sound, full color, running time 11 minutes. Available through the Company's Film Department.

For more details circle 200 on Enclosed Return Postal Card.

LETOURNEAU-WESTINGHOUSE CO., Peoria, Ill., has released a new 16-page bulletin, Form No. TD-80, on its 218-hp Model C "Tournatractor." Important features of the machine are illustrated and described. On-the-job pictures show the "Tournatractor" engaged in various construction operations. Optional attachments are pictured. Specifications are included.

For more details circle 201 on Enclosed Return Postal Card.

CONCRETE CYLINDER CASTING: The Master Builders Co., Cleveland 3, Ohio, has issued Bulletin RM-48 outlining approved concrete cylinder casting procedures, including selections of molds, correct sample taking and filling, handling, and curing of cylinders.

For more details circle 202 on Enclosed Return Postal Card.

THE "HI-WAY" MODEL "TG" Hydraulically Operated Tailgate Spreader is briefly described in a folder just issued by Highway Equipment Company, Dept. H44-4, 616 "D" Avenue, N. W., Cedar Rapids, Iowa. Specifications and detail illustrations are given.

For more details circle 203 on Enclosed Return Postal Card.

MAINTENANCE, INCORPORATED, WOOSTER, OHIO, has announced two revised bulletins on Jennite J-16 surface seal for asphalt pavements. Originally issued in 1956, these bulletins have been brought up to date and considerable new information included. They list major causes of asphalt deterioration and explain how these can be retarded with Jeannite. Application methods are outlined in detail. Ask for LL-2992 and M-100.

For more details circle 204 on Enclosed Return Postal Card.

GENERAL ELECTRIC COMPANY, Schenectady 5, N. Y., has issued Bulletin GEA-6943, 12 pages, describing its new line of mercury luminaires for roadway lighting. The 250-, 400-, and 1000-watt luminaires feature improved lighting performance, high electrical efficiency, and low installation and maintenance costs. Application data for various types of roadway lighting is given with diagrams, photos, and photometric data. New cadmium-sulphide photoelectric control is also described. Guide form specifications and ordering information are also included.

For more details circle 205 on Enclosed Return Postal Card.

With the Manufacturers and Distributors

American Hoist & Derrick Company of St. Paul, Minnesota has acquired the firm of Hetherington & Berner, pioneer Indianapolis manufacturers of stationary and portable asphalt plants and paving machinery. John E. Carroll, President of American Hoist, in making the announcement said that Donald R. Berner, Hetherington & Berner Vice President, will become General Manager of the new wholly owned subsidiary and that both Indianapolis plants, employing about 280 people, will continue to operate under the Hetherington & Berner name.

A New Management Team consisting of George L. Collier as president and T. K. Dorsey, executive vice president, heads Dorsey Trailers following the sudden death of J. V. Wright, president.

Dr. R. P. Dinsmore, vice president of research and development for The Goodyear Tire & Rubber Company, who has completed a colorful 45 years in the research field, was honored and congratulated by company officers and directors at a recent board meeting.

Dale L. Bunday has been named national product planning manager for two-way radio equipment engineered by the General Electric Communication Products Department at Lynchburg, Va. Bunday succeeds Robert L. Casselberry, who recently was named acting manager of G-E's Technical Products Operation at Syracuse, N. Y.

Henschel-Werke G.m.b.H. of Kassel, West Germany, a 149-year old company known throughout the world for its design and manufacture of locomotives of any drive, trucks, buses, diesel engines, pumps, aircraft and missile components, chemical process equipment, and complete industrial plants will enter the American market, and has appointed the Norca Machinery Corporation of 350 Fifth Ave., New York City, as its sales representative in the United States and Canada.

FWD Corporation, Clintonville, Wisc., manufacturer of specialized heavy-duty vehicles, has announced the appointment of John P. Mann as a project engineer in the military engineering department. The announcement was made by G. D. Simonds, FWD engineering vice president.

Carl R. Rolf has been named President of Pioneer Engineering, Division of Poor & Company, Inc., Minneapolis, Minnesota, to succeed Oscar J. Ellertson who resigned as President to devote his full time to newly assigned duties as Vice President of Poor & Company, with headquarters in Chicago.

Harnischfeger Corporation of Milwaukee, has named Louis A. Flora as Director of Advertising and Sales Promotion, for the company's Construction and Mining Division.

ASTM MEETING

(Continued from page 180)

practical and statistical significance of ASTM tests on bituminous paving materials. Mr. Fink divided the problem into three parts: (1) assurance that those test methods which have proved their place in bituminous technicality, are adequately described both as to procedural details and the level of precision that can be expected; (2) test methods which have proved workable and precise in the laboratory should be properly fitted into the technicality of the use of the materials, such as in specifications; and (3) new test methods must be evolved where there is an established need.

INDEX TO ADVERTISERS

Here's a demonstration right on this page!

AT THE DRAGLINE, the Cat DW20-PW20 Unit was confined to turning around in a 40-50 foot wide space. Despite the big size of the unit, it was able to make nonstop turns—a great advantage working in close quarters. The wide target of the PW20 helped decrease load time and increase payload.

HAULING, the Cat-built Engine combined with the 10-speed transmission of the DW20 enabled the big rig, with big loads, to negotiate soft haul road conditions for fast cycle times trip after trip. The Caterpillar DW20-PW20 unit's wide base tires provided excellent flotation both on the haul road and at the dumping area.

DUMPING, the PW20's steep sides (18 in. from vertical) and rear door enabled it to shed the sticky material with dispatch. The DW20-PW20 walked away from its load with minimum or no lost time. Use of high-tensile steel in the PW20's construction enabled it to handle heavy payloads.

Get the low-down on the new Cat DW20-PW20 Unit from this time and cost study

THE JOB: Simms Bayou Improvement, Houston, Texas. *Date*—March 13, 1959. *Contractor*—Lee and McKnight Contracting Co., Houston.

JOB CONDITIONS: *Material*—black gumbo and blue clay. *Density*—3000 lb./yard. *Haul length*—3,420 ft. (one way). *Grades*—none (two 90° turns). *Haul road conditions*—first 400 ft. with 300 lb./ton rolling resistance. Balance of haul road maintained—rolling resistance 150 lb./ton. *Loaded by*—dragline with 3 cu. yd. bucket.

AVERAGE LOAD TIME	3.44 min.
AVERAGE HAUL, DUMP AND RETURN TIME	7.17 min.
AVERAGE CYCLE TIME	10.61 min.
AVERAGE PAYLOAD (LB.)	78,633
AVERAGE PAYLOAD IN BANK YARDS AT 3000 LB./YD.	26.31
PRODUCTION ON A 60-MINUTE HOUR	
Trips/hour	5.65
Cu. yd./hour	148.65
OWNING AND OPERATING COST PER YARD	11.85¢
PRODUCTION AT 75% EFFICIENCY	
Cu. yd./hour	111.5
Cost/cu. yd.	15.8¢

. . . for more details circle 297 on enclosed return postal card

The demonstration described and pictured here was made in comparison with competitive units. The new Cat DW20 Series G Tractor with new Athey PW20 Bottom Dump Trailer came through with high production at *lowest cost per yard.* As a result, the contractor purchased a DW20-PW20 Unit.

Consider the facts about this high-capacity rig. The DW20 Series G has a rating of 345 HP (maximum output). It hits top speeds of 35.8 MPH quickly for cutting cycle times. It provides maximum rimpull of 39,565 lb. for unmatched performance on adverse grades. The PW20, constructed of extra strength steel, has a struck capacity of 27 cu. yd.—and a maximum carrying capacity of 40 tons. Here's a matched pair designed to handle *more* work *faster* at *lower* cost per yard than ever.

For the complete time and cost study of this job, see your Caterpillar Dealer. Ask for a demonstration, too. That's the best way to judge what the big new DW20-PW20 can do on your job. Name the place and date—he'll demonstrate!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

THE ONLY COMPLETE TRACTOR-TRAILER LINE... BY THE LEADERS

28 miles of Asphalt

for this Texas State Highway

Photographs

(Left) Power graders were used to spread leveling course of TEXACO Asphaltic Concrete over old pavement.

(Right) Mechanical paver lays second course of TEXACO Asphaltic Concrete. Note small roller attached to paver, which bevels edge of pavement.

Contractor

Gulf Bitulithic Company, Houston

This Texas project illustrates an important advantage of Asphalt highways—the ease and economy with which Asphalt paving can be strengthened to serve increased traffic.

To the existing Asphalt pavement on this 28-mile section of State Highway 87, Texas recently added a new, two-course surface of hot-mix Texaco Asphaltic Concrete. A strong, lasting bond forms between the new and old Asphalt courses, providing a pavement which readily copes with today's heavier traffic load.

The aggregate used in the new plant-mixed Texaco Asphalt surface on Route 87 consisted of uncrushed gravel, shell screenings and sharp field sand.

Helpful information on all of the heavy-duty, intermediate and low-cost types of Texaco Asphalt paving for streets, highways, airports and parking areas is supplied in two free brochures. Our nearest office will be glad to mail you copies. No obligation.

TEXACO INC., Asphalt Sales Div., 135 E. 42nd Street, New York 17

Boston 16 (20 Providence St.) • Chicago 4 (332 So. Michigan Ave.) • Houston 1 (720 San Jacinto St.)
Jacksonville 1 (P.O. Box 749) • Denver 1 (P.O. Box 2100) • Philadelphia (1411 Walnut St.)
Richmond 11, Va. (P.O. Box 1379) • Minneapolis 3 (Groveland Ave.-Clifton Pl.)

TEXACO REG. T. M.

TEXACO ASPHALT

. . . for more details circle 362 on enclosed return postal card